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                  to PHARMASEARCH
 NEWS 14  Oct 09  Korean abstracts now included in Derwent World Patents
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 NEWS 15  Oct 09  Number of Derwent World Patents Index updates increased

 NEWS EXPRESS  August 15 CURRENT WINDOWS VERSION IS V6.0c,
               CURRENT MACINTOSH VERSION IS V6.0 (ENG) AND V6.0J (JP),
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FILE COVERS 1971 TO PATENT PUBLICATION DATE: 11 Oct 2001 (20011011/PD)
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FILE LAST UPDATED: 11 Oct 2001 (20011011/ED)
HIGHEST GRANTED PATENT NUMBER: US6249914
HIGHEST APPLICATION PUBLICATION NUMBER: US2001029620
CA INDEXING IS CURRENT THROUGH 11 Oct 2001 (20011011/UPCA)
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This file contains CAS Registry Numbers for easy and accurate
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=> s (tea or coffee)(l)bag?
         16455 TEA
           500 TEAS
         16641 TEA
                 (TEA OR TEAS)
         15007 COFFEE
           385 COFFEES
         15045 COFFEE
                 (COFFEE OR COFFEES)
        105056 BAG?
L1        3247 (TEA OR COFFEE)(L)BAG?

=> s non heat seal
       1115562 NON
            16 NONS
       1115566 NON
                 (NON OR NONS)
        699334 HEAT
         42382 HEATS
        704731 HEAT
                 (HEAT OR HEATS)
        325063 SEAL
        147466 SEALS
        362644 SEAL
                 (SEAL OR SEALS)
L2          14 NON HEAT SEAL
                 (NON(W)HEAT(W)SEAL)

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=> l1 and l2
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=> s l1 and l2
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L3 2 L1 AND L2

=>
=> d all

L3 ANSWER 1 OF 2 USPATFULL
AN 2000:145929 USPATFULL
TI Porous web material
IN Gbur, Ivan, Lancashire, United Kingdom
Tomkinson, Brian, Bolton, United Kingdom
Alston, Joyce, Lancashire, United Kingdom
PA J. R. Crompton Limited, Lancashire, United Kingdom (non-U.S. corporation)
PI US 6139883 20001031
WO 9704956 19970213
AI US 1998-983378 19980428 (8)
WO 1996-GB1839 19960729
19980428 PCT 371 date
19980428 PCT 102(e) date
PRAI GB 1995-15617 19950729
GB 1995-23162 19951113
DT Utility
FS Granted

REP	US 2531594	Nov 1950	426/084.000	Abrahams
	US 2928765	Mar 1960	426/084.000	Kurjan
	US 3386834	Jun 1968	426/084.000	Noiset et al.
	US 3529925	Sep 1970	426/077.000	Thomas et al.
	US 3640727	Feb 1972	426/077.000	Heusinkveld
	US 4582666	Apr 1986	264/557.000	Kenworty et al.
	US 4801464	Jan 1989	426/079.000	Hubbard, Jr.
	US 5288402	Feb 1994	210/488.000	Yoshida
	US 5443606	Aug 1995	055/486.000	Hassenboehler, Jr. et al.
	US 5496573	Mar 1996	426/084.000	Tsuji et al.
	US 5500167	Mar 1996	264/041.000	Degen
	US 5780369	Jul 1998	442/384.000	Allison et al.
	CA 651488	Oct 1962		
	EP 615921	Sep 1994		
	DE 2636486	Feb 1978		
	WO 9709167	Mar 1997		

EXNAM Primary Examiner: Bhat, Nina
LREP Woodard, Emhardt, Naughton, Moriarty & McNett
CLMN Number of Claims: 33
ECL Exemplary Claim: 1
DRWN 1 Drawing Figure(s); 1 Drawing Page(s)
AB A fibrous, porous web material of the **non-heat seal** tissue having a basis weight of 9-18 gm-2 and comprises a first layer and a second layer juxtaposed thereto wherein the second layer. The first layer comprising vegetable fibers and a second layer comprising hardwood fibers, the second layer has a smaller pore size than the first layer. The paper is useful for producing beverage infusion bags (e.g. teabags) from which there is minimal passage of fine particles from the bags into their packaging.

PARN This application claims the benefit of national stage application PCT/GB96/01839, filed Jul. 29, 1996.

SUMM The present invention relates to a fibrous, porous web material of the **non-heat seal** type intended for use particularly, but not exclusively, for the production of infusion sachets for brewing beverages such as **tea** and **coffee**
.

Infusion sachets for brewing beverages (e.g. so called teabags and **coffee bags**) are generally produced from either "heat

seal" or "**non-heat seal**" fibrous porous web material (hereinafter also referred to as paper for convenience). Heat seal paper generally comprises two layers. One of these two layers includes fusible polymeric fibres which allow two layers of the paper to be heat sealed together in the production of infusion **bags**. The other layer is present as an insulation layer to prevent polymer (in the other layer) sticking to heated dies during conversion of the paper to produce an infusion sachet. In contrast, a **non-heat seal** paper (which normally has a basis weight in the range of 9 to 18 g m.sup.-2 and typically about 12.3 g m.sup.-2) is generally comprised of a single layer comprised of vegetable fibres which does not incorporate fusible polymeric fibres. Thus, as its name suggests, **non-heat seal** paper cannot be heat sealed to itself. Infusion **bags** are produced from such paper by crimping or otherwise mechanically securing two layers of the paper together.

There is however a problem in some areas with conventional **non -heat seal** papers for use in the production of teabags in that fine **tea** dust (resulting from interaction of **tea** leaves during processing thereof) or fine particles of **tea** have a tendency to pass through the paper to the outside of the teabag. Since teabags are generally packaged in boxes or other types of "outer" packaging, the fine **tea** particles or dust are "loose" in the packaging and this is undesirable from the aesthetic viewpoint.

One possibility for overcoming this problem would be to increase the percentage of finer fibres (preferably hardwood fibres) in the stock from which the single ply paper is produced. This would result in a paper with smaller pores thus reducing the amount of fine **tea** or **tea** dust which can pass through the paper.

The increase of hardwood fibres or other short fibres in the single layer to achieve the required pore size distribution would, however, affect overall paper strength to the extent that the paper would not have sufficient strength for manufacture into infusion **bags**. A further disadvantage which would be associated with the use of hardwood fibres in the layer would be the incidence of pin-hole generation through air entrainment.

A further disadvantage of conventional non-heat sealpaper is that it is difficult to provide a pattern in the paper using conventional methods. The patterns which are desired are those which can readily be produced in papers of the "heat seal" type. Such patterns may comprise a matrix of perforations which are formed through the web and which are intended to allow the passage of water therethrough. Alternatively the pattern may be either a logo or other marking indicating the manufacture of either the paper or infusion sachets prepared therefrom.

Such perforations are generally formed in heat seal paper by one of two methods. Firstly the perforations may be formed by a pattern of projections (known as knuckles) on the wire on which the fibrous suspension (used for producing the paper) is produced during the "wet laying" operation. Secondly the pattern may be formed in the web by fluid jets, e.g. using a PERFOJET apparatus.

Non-heat seal paper is generally comprised of a single layer (as indicated above) and typically has a basis weight of 12.3 g m.sup.-2. The patterning methods discussed above cannot generally be used for such **non-heat seal** paper. Thus, if the paper is formed on a wire provided with knuckles, the paper cannot be easily released from the wire. This is believed to be due to the fact that the cellulosic fibres of the paper are more cohesive because of their greater contact with the wire and their

wetness (and as such are therefore more difficult to release) than the cylindrical synthetic fibres in heat seal paper. If a liquid jet is used to pattern such a **non-heat seal** paper, the resultant material is too "open" as the jet would `strike through` the single layer and would allow beverage precursor material (e.g. **tea** leaves) to pass through the paper.

It is therefore an object of the present invention to obviate or mitigate the above mentioned disadvantages.

According to the first aspect of the present invention there is provided a fibrous, porous web material of the **non-heat seal** type having a basis weight of 9 to 18 g m.sup.-2 and comprising a first layer and a second layer juxtaposed thereto wherein the second layer has a smaller pore size then the first layer.

According to the second aspect of the present invention there is provided a beverage infusion **bag** comprising a beverage precursor material enclosed within a sachet formed of a material in accordance with the first aspect of the invention.

In the web material of the first aspect of the invention, the second layer has a smaller pore size than the first layer. The material is such that it is capable of preventing or inhibiting passage therethrough of fine particles of a beverage precursor material (e.g. **tea** leaves) and such that it has the required strength for conversion to beverage infusion **bags**. The invention thus provides a **non-heat seal** paper which may be converted to **tea bags** from which there is minimal passage of fine particles from **bags** into their packaging.

Obviously the reduction in porosity as provided by the second layer is not so high as to prevent passage of water through the material during infusion of the beverage.

The material of the invention also has the advantage that it may be patterned by means of a fluid jet, as detailed more fully below.

The material of the invention preferably has a basis weight of 9 to 15 g m.sup.-2, more preferably 9 to 14 g m.sup.-2, even more preferably 11 to 13 g m.sup.-2, and most preferably 12 to 13 g m.sup.-2. Typically the basis weight will be 12.3 to 12.4 gm.sup.-2.

The material of the invention may be produced in accordance with a third aspect of the invention by wet laying the first layer and, whilst draining water therefrom, laying the second layer on top of the first layer. This "two stage" production method has an advantage in that any voids in the first layer caused by air-entrainment will be filled (as a result of drainage through the voids) by the fibres of the second layer. Thus the size of the voids is reduced, contributing to the overall reduced porosity of the web. There is the further advantage of the "two stage" process in that for a material of a particular basis weight it allows an increased speed of production as compared to the production of a single layer material of the same basis weight.

The second layer may be produced in a number of ways to ensure that it has a pore size lower than the first layer. In a preferred embodiment of the invention, the second layer is produced from fibres (e.g. hardwood fibres) which are shorter and finer than the fibres (e.g. vegetable fibres) of the first layer. Alternatively, it is possible for the second layer to comprise fibres which are coarser than those of the first layer and to be used in an amount such as to provide a highly tortuous path along which a particle would need to pass to traverse the second layer. It is this highly tortuous path which provides the required small pore

size.

As indicated, it is preferred that the majority of the fibres from which the second layer is formed have a mean cross-sectional size and/or length less than those of the first layer.

Preferably the fibres in the second layer provide 10 to 50% by weight of the total weight of the web material. In a preferred material in accordance with the invention, the first layer comprises vegetable fibres and the second layer comprises hardwood fibres.

The hardwood fibres of the second layer may for example comprise 10% to 50%, preferably 20% to 40%, by weight of the total weight of the web material. The hardwood fibres preferably have a length of 0.4 mm to 2.5 mm and may for example have a mean length of about 0.8 mm. The fibre width may be 10 to 25 .mu.m with a mean of about 14 .mu.m. Hardwood fibres are finer and shorter than softwood fibres. Examples of hardwood fibres which may be used include birch, beech and eucalypt. If desired, the second layer may comprise of Softwood, Sisal and/or Jute or man made fibres as part of the fibre components of the layer.

Although it is preferred that the second layer comprises hardwood fibres, it is possible for the second layer to be comprised of other fibre types.

Preferably the vegetable fibres of the first layer provide 50% to 90%, more preferably 50% to 70%, by weight of the web material. These fibres will generally have a length of 0.8 mm to 9 mm and may for example have a mean length of about 4.3 mm. A suitable vegetable fibre is Manila (Abaca).

If desired, the first layer may comprise Sisal and/or Jute as part of the vegetable fibre component of the layer. It may also be possible to produce a similar material with man made fibres, although the preferred way would be as described above.

If desired, a proportion of the vegetable fibres of the first layer may be replaced by softwood fibres. Preferably the amount of softwood fibres does not exceed 75% by weight of the first layer. Softwood fibres are long, flat ribbon-like fibres which are readily distinguished by a person skilled in the art from vegetable fibres and hardwood fibres. The softwood fibres may have a length of 0.8 mm to 5 mm and a width of 12 to 60 .mu.m. Typical means of these values are 3.8 mm and 29 microns respectively. The softwood fibres may for example be obtained from spruce, pine, cedar, western hemlock, fir or redwood.

It is preferred that the web material of the invention has a thickness in the range of 30-100 .mu.m more typically in the region of 40-60 .mu.m.

It should be appreciated that the invention also covers papers comprising three or more layers. Thus, it is possible in accordance with the invention to produce a paper having a central layer comprised of softwood fibres sandwiched between an outer layer comprised of Manila fibres and another outer layer comprised of hardwood fibres. The layer comprised of hardwood fibres would have the smallest pore size whereas the layer comprised of Manila fibres may have a larger pore size than the layer comprised of softwood fibres or vice versa. This construction may be modified so that the layer comprised of Manila fibres is the central layer and the layer comprised of softwood fibres forms an outer layer.

As indicated above, the material in accordance with the invention may be patterned by means of fluid jets during the paper forming step on the

papermaking fabric or wire.

If the material comprises only two layers and the fibres of the second layer are shorter and finer than those of the first layer then the pattern is formed in the second layer of the material, i.e. that layer having the smaller pores. This is an important feature since the shorter fibres (of the second layer) provide good pattern definition because of their lower cohesiveness and greater ease of movement than the longer fibres of the first layer which provide strength during processing.

The ability to provide patterns in **non-heat seal** papers is an important aspect of the present invention in its own right and therefore in accordance with a fourth aspect of the invention there is provided a method of producing a patterned paper of the **non-heat seal** type comprising wet laying a first fibrous layer and subsequently a second layer thereon, and forming a pattern in the wet laid web during the paper forming step whilst the web is on the papermaking fabric or wire by means of fluid jets.

The fluid jets are preferably liquid jets, e.g. water jets. The pattern may be formed whilst the paper is on the wire by means of a patterning station which is comprised of a rotary hollow cylinder having perforations (defining the required pattern) in the wall thereof and means for directing a fluid radially outwardly through the perforations in the cylinder to form the pattern in the web. The liquid pressure is preferably 100-800 kPa (1-8 bar), more preferably 300-400 kPa (3-4 bar). The pattern may be formed using a PERFOJET apparatus.

A method of producing a web material in accordance with the invention will be described with reference to the accompanying drawing.

The web material is formed from two fibrous stocks. One stock (for forming the first layer) comprises vegetable-fibres (and optionally other fibre types, e.g. softwood fibres) and the other stock (for forming the second layer) comprises hardwood fibres (and optionally other fibre types).

Typically the process for production of this paper is as follows:

As shown in the drawing, the stock for forming the first layer 1 is laid onto a continuously moving paper forming fabric 2 from a head box 3. Water is withdrawn as shown by the arrows 4 and the second layer 5 is subsequently laid down from a further head box 6.

A pattern is formed at a patterning station 7 comprised of a rotary perforated cylinder 8 within which is located a spray-head 9 for providing liquid (preferably water) jets, which are directed through the perforations in cylinder 8. It is these perforations which provide the desired pattern. A suction box 10 serves to remove water from the web.

The liquid jet pressure is preferably 3-4 bars which causes perforations to be formed in the layer 2. There is no substantial perforation of layer 1.

Layer 5 is the one having the smaller pore size and is formed from shorter fibres than used for layer 1.

The web may be passed around steam heat drying cylinders (not shown) or other drying means (e.g. gas heated through dryers) and may be subjected to further impregnation with additive at a size press (not shown). Wet or dry strength agents may be added either in the head box or the size press.

Other machine configurations could also be used.

Papers having the three layer construction may be produced using an apparatus of the type illustrated in the drawing modified by the inclusion of a third head box.

DETD The invention is illustrated by the following non-limiting Example.

EXAMPLE

A paper having a basis weight of 12.3 g m.sup.-2 was prepared using the procedure shown in the drawing by wet laying a first (base) layer of vegetable fibres combined with softwood and a second (top) layer of hardwood fibres which comprised 25% by weight of the total weight of the material.

Tests were conducted on the material obtained to determine how effective it was at preventing the percolation therethrough of fine sand. The sand dust percolation was determined as the percent by weight of a sample of sand having a particle size in the range 106-150 .mu.m which would pass through the paper in a standard test which involves vibrating a horizontally disposed sample of the paper on which the sand is located.

As a result of the test, less than 10% of the sand was found to have passed through the papers. This compares with a value of 35-50% obtained using a conventional **non-heat seal** paper sold in the industry.

Thus the material of the invention is superior to prior art materials for use in producing beverage infusion **bags** (e.g. **tea bags**) to prevent dust therein passing outwardly through the paper.

CLM What is claimed is:

1. A fibrous, porous web of **non-heat seal** tissue having a basis weight of 9 to 18 g m.sup.-2 and comprising a first layer comprising vegetable fibres and a second layer comprising hardwood fibres juxtaposed thereto wherein the second layer has a smaller pore size than the first layer.

2. A method as claimed in claim 1 having a basis weight of 9 to 15 g m.sup.-2.

3. A material as claimed in claim 2 having a basis weight of 9 to 14 g m.sup.-2.

4. A material as claimed in claim 3 having a basis weight of 11 to 13 g m.sup.-2.

5. A material as claimed in claim 4 having a basis weight of 12 to 13 g m.sup.-2.

6. A material as claimed in claim 1 wherein the majority of the fibres of the second layer are finer than the majority of the fibres of the first layer.

7. A material as claimed in claim 1 wherein the first layer comprises vegetable fibres in an amount to provide 50% to 90% by weight of the web material.

8. A material as claimed in claim 7 wherein the vegetable fibres of the first layer provide 50% to 70% by weight of the web material.

9. A material as claimed in claim 1 wherein the vegetable fibres have a length of 0.8 mm to 9 mm.

10. A material as claimed in claim 1 wherein the vegetable fibre is Manila.

11. A material as claimed in claim 1 wherein the first layer also incorporates softwood fibres.

12. A material as claimed in claim 11 wherein the softwood fibres have a length of 0.8 mm to 6 mm.

13. A material as claimed in claim 11 wherein the softwood fibres are of spruce, pine, cedar, western hemlock, fir or redwood.

14. A material as claimed in claim 1 wherein the hardwood fibres have a length of 0.4 mm to 2.5 mm.

15. A material as claimed in claim 1 wherein the hardwood fibres are of birch, beech or eucalypt.

16. A material as claimed in claim 1 wherein the hardwood fibres of the second layer comprise 10% to 50% by weight of the total weight of the web material.

17. A material as claimed in claim 16 wherein the hardwood fibres of the second layer comprise 20% to 40% by weight of the total weight of the web material.

18. A material as claimed in claim 1 which comprises three or more layers.

19. A material as claimed in claim 1 having a thickness of less than 100 micrcons.

20. A material as claimed in claim 1 wherein a layer of the material has a pattern formed therein by means of fluid jets.

21. A material as claimed in claim 20 comprised of two layers and wherein the pattern is formed in the layer having the smaller pore size.

22. A material as claimed in claim 21 comprised of three or more layers and wherein the pattern is formed in either of the outer layers.

23. A beverage infusion bag comprising a beverage precursor material enclosed within a sachet formed of a material as claimed in claim 1.

24. A method of producing a material as claimed in claim 1 wherein the layers are successively wet-laid onto a paper-forming fabric or wire.

25. A method as claimed in claim 24 wherein water is withdrawn from the first layer prior to laying the second layer.

26. A method as claimed in claim 24 additionally comprising the step of forming a pattern in one of the layers by means of fluid jets.

27. A method as claimed in claim 26 wherein the pattern is formed whilst the paper is on the wire by means of a patterning station which is comprised of a rotary hollow cylinder having perforations defining the required pattern in the wall thereof and means for directing a fluid radially outwardly through the perforations in the cylinder to form the pattern in the web.

28. A method as claimed in claim 26 wherein title fluid is liquid.

29. A method as claimed in claim 28 wherein the liquid pressure is 100 to 800 kPa (1 to 8 bars).

30. A method as claimed in claim 29 wherein the liquid pressure is 300 to 400 kPa (3 to 4 bars).

31. A method of producing a patterned paper of **non-heat seal** tissue comprising wet laying a first fibrous layer and subsequently a second layer thereon, and forming a pattern in the wet laid web during the paper forming step whilst the web is on the papermaking fabric or wire by means of fluid by means of fluid jets.

32. A method as claimed in claim 31 wherein water is withdrawn from the first layer prior to laying the second layer.

33. A method as claimed in claim 31 in which the first layer comprises vegetable fibres and the second layer comprises hardwood fibres.

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INCL    INCLM: 426/077.000
        INCLS: 426/079.000; 426/084.000; 428/316.600; 162/091.000; 162/098.000;
               162/141.000; 162/213.000
NCL     NCLM:  426/077.000
        NCLS:  162/091.000; 162/098.000; 162/141.000; 162/213.000; 426/079.000;
               426/084.000; 428/316.600
IC      [7]
        ICM: B65B029-02
        ICS: B32B007-02; D21H027-38
EXF     426/77; 426/79; 426/84; 428/316.6; 162/91; 162/98; 162/141; 162/213
ARTU    171
```

=> d 2 all

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L3    ANSWER 2 OF 2  USPATFULL
AN      81:50283  USPATFULL
TI      Heat seal fibrous web and method of its manufacture
IN      Elston, Colin, Windsor, CT, United States
        Hoffman, Herbert A., Longmeadow, MA, United States
        Murphy, H. Joseph, Longmeadow, MA, United States
PA      The Dexter Corporation, Windsor Locks, CT, United States (U.S.
        corporation)
PI      US 4289580              19810915
AI      US 1979-93441           19791113 (6)
DT      Utility
FS      Granted
REP     US 995602       Sep 1909  162/115.000   Howes
        US 2414833      Jan 1947  162/129.000   Osborne
        US 3067087      Dec 1962  162/157.000R  Gorski et al.
        US 3350260      Oct 1967  162/116.000   Johnson
EXNAM   Primary Examiner: Chin, Peter
LREP    Prutzman, Kalb, Chilton & Alix
CLMN    Number of Claims: 17
ECL     Exemplary Claim: 1
DRWN    3 Drawing Figure(s); 1 Drawing Page(s)
```

AB Improved infusion web material for **tea bags** and the like is provided by using synthetic pulp in the heat seal phase and forming therein an array of a large number of small discrete craters. These craters, which exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters, are formed prior to drying the initially formed multi-phase material by directing a low impact mist-like liquid spray onto the heat seal phase. The droplets from the spray displace the fibers to form the shallow craters and, at times, expose portions of the underlying **non-heat**

seal fiber phase. The small craters are present throughout the heat seal phase at a concentration of at least about 40 per square centimeter and occupy about 10-75 percent of the total exposed surface area of the heat seal fiber phase of the material. The web also is treated with a surfactant.

SUMM TECHNICAL FIELD

The present invention relates generally to water laid infusion web materials and more particularly is concerned with a new and improved multi-phase heat sealable fibrous web having particular application as infusion packaging material, such as for **tea bags** and the like. The invention also relates to the process of manufacturing such fibrous web materials.

BACKGROUND ART

Heretofore, heat sealable **tea bag** papers have comprised both single phase and multi-phase sheet material. Both materials have included **non-heat seal** fibers such as cellulosic fibers in combination with heat seal fibers. The particular heat seal fibers used have included thermoplastic fibers, such as the fibers of a copolymer of polyvinyl acetate, commonly referred to as "vinyon," and polyolefin fibers such as fibers of polyethylene and polypropylene. These synthetic heat seal fibers are typically smooth rod-like fibrous materials exhibiting a low specific surface area. They form a highly porous and open structural arrangement which, despite their hydrophobic character, permit adequate liquid permeability and transmission of both hot water and **tea** liquor through the sheet material during the normal brewing process. During manufacture the sheet material is dried by a conventional heat treatment resulting in a slight contraction of the heat seal thermoplastic fibers that maintains and enhances the desired open distribution of the heat seal particles throughout the sealing phase of the web.

In recent years, fibrillar materials formed from polyolefins and similar polymers have been introduced in the paper industry. These materials, commonly referred to as "synthetic pulps", exhibit certain processing advantages over the smooth rod-like synthetic fibers used heretofore. The synthetic pulps exhibit a fibrilliform morphology and resultant higher specific surface area. Additionally, they are more readily dispersible in water without the need for additional surface active agents and, although hydrophobic in nature, they do not dewater as rapidly as conventional synthetic fibers and therefore avoid plugging problems in lines, pumps, etc., within the paper-making machine. Further, these synthetic particles do not exhibit the tendency to "float out" in chests and holding tanks used in the typical paper-making process. For these reasons the synthetic pulps exhibit a potential for use as the heat seal component of infusion package materials, particularly since they provide substantially improved wet seal strength under end use conditions, that is, improved wet seal strength in a hot aqueous liquid environment and improved resistance to seal delamination under boiling and steaming test conditions.

Despite the apparent advantages evident in the use of synthetic pulp for heat seal infusion paper application, it has been found that such material exhibits a significant disadvantage with respect to its infusion properties and its wettability. This disadvantage relates directly to its usefulness in the paper-making process, that it, its fibrilliform structure and high specific surface area. When the synthetic pulp is heat treated, as in the conventional drying operation, it tends to soften and flow, typically forming a film, albeit discontinuous, particularly in the heat seal phase of a multi-phase sheet material. Unlike the highly porous and open web structure formed

by the larger and smoother synthetic fibers, the high surface area pulp with its lower density, smaller particle size and more numerous particles results in a closed, low permeability structure. In addition, the hydrophobic nature of the basic polymer inhibits water permeability and any surfactant added to the synthetic pulp is neutralized during the drying process. The result is that certain areas of the web surface are rendered water impermeable substantially retarding or inhibiting infusion and reducing the water permeability and wettability of the material. In use, the non-wetted or partially wetted areas of the web material are easily observed as opaque areas on the sheet while the thoroughly wetted areas exhibit a transparent appearance. The reduced wettability of the web material coupled with its mottled opaque appearance influences the aesthetic attractiveness of the product under end use conditions and, therefore, its acceptability by the consumer.

DISCLOSURE OF INVENTION

Accordingly, the present invention provides a new and improved heat seal fibrous web material utilizing synthetic pulp as the heat seal fibrous component yet at the same time obviates the infusion and wettability deficiencies noted hereinbefore with respect to the use of such material. More specifically there is provided a heat sealable fibrous web having a disruptively modified heat seal phase having a larger total infusion area with an attendant enhancement in liquid permeability.

Additionally the present invention provides a new and improved process for the manufacture of heat seal infusion web materials having excellent infusion characteristics and improved strength characteristics through the utilization of synthetic pulp and the incorporation within the process of a technique for overcoming the infusion and wettability deficiencies observed heretofore with respect to the use of synthetic pulp material. This process involves the modification of essentially only the heat seal phase of a multiphase heat seal infusion web material to facilitate improved infusion characteristics despite the greater covering power of the high surface area hydrophobic synthetic pulp material. This is accomplished by disruptively modifying the heat seal material's heat generated film, thereby increasing the open surface area of the heat seal phase to provide a larger total infusion area and greater water permeability. This process includes the step of forming a random array of small high-infusion areas having a reduced synthetic pulp content, with some areas being essentially free of heat seal synthetic fibers so as to fully expose the underlying **non-heat seal** phase of the multi-phase material. These small high-infusion areas can be formed in a simple and facile manner at relatively low cost with no substantial decrease in the production rate of the multi-phase heat seal material yet with improved seal strength under end use conditions by a simple low impact mist-like spray and subsequent treatment with a surfactant.

The heat seal phase of a multi-phase infusion web material is provided with a random array of a large number of small discrete craters by displacement of particles in the heat seal phase to form the craters. These craters, which expose portions of the underlying **non-heat seal** fiber phase, exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters and are formed prior to drying the initially formed multi-phase web material. The small craters are present throughout the heat seal phase at a concentration of at least about 40 per square centimeter and occupy about 10-75 percent of the total exposed surface area of the heat seal fiber phase of the material.

DRWD BRIEF DESCRIPTION OF DRAWINGS

A better understanding of the invention will be obtained from the

following detail description of the several steps of the process together with the relation of one or more of such steps with respect to each of the others and the article processing the features, properties and relation of elements exemplified in the following detailed description. In the drawing:

FIG. 1 is a schematic view of the wet end of a paper-making machine depicting one way of operating the process of the present invention for producing a multi-phase infusion web material;

FIG. 2 is an illustration of a planar view of the fibrous web material of the present invention depicting the craters formed within the heat seal phase, the view being substantially enlarged for purposes of illustration, and

FIG. 3 is a further enlarged sectional view of the web material of FIG. 2 taken along the line 3--3 of FIG. 2.

DETD BEST MODE FOR CARRYING OUT THE INVENTION

As mentioned hereinbefore, the present invention provides a technique for improving the infusion characteristics of a heat seal fibrous web material suited for use in **tea bags** or the like.
This is accomplished by, in effect, enhancing the water permeable surface area of the heat seal phase of that material. In the preferred embodiment the enhancement is achieved primarily by physical disruption of the heat seal phase and secondarily through chemical treatment of the fibrous web material. It is this combination of physical and chemical treatments which provides the enhanced infusion characteristics found necessary when using larger surface area heat seal particles of low density and smaller particle size, such as the fibrous particles in commercially available synthetic pulp.

As mentioned, the invention is primarily concerned with multi-phase sheet material since it is directed toward the disruption of only one phase of the multi-phase material, namely, the heat seal phase. Additionally, the invention is primarily concerned with multi-phase water laid material produced in accordance with the conventional paper-making techniques. In this connection numerous different techniques have been employed herefore to make the multi-phase fibrous webs. Typical of those found most useful in the production of infusion web materials is the dual headbox technique described in U.S. Pat. No. 2,414,833. In accordance with that process and as illustrated in FIG. 1, a suspension of **non-heat seal** fibers 10
flow through a primary headbox 12 and continuously deposit as a base phase on an inclined wire screen 14. The heat seal material 16 is introduced into the primary headbox at a location immediately after or at the point of deposition of the **non-heat**
seal fibers on the inclined wire. This may be carried out by means of an inclined trough 18, as shown, or by a secondary headbox in such a manner that the heat seal particles comingle slightly with the **non-heat seal** paper-making fibers flowing
through the primary headbox 12. In this way, the non-thermoplastic fibers 10 have a chance to provide a base mat or **non-**
heat seal phase, 20, best shown in FIG. 3, prior to
the deposition of the heat seal phase, 22. As is appreciated the latter is secured to the base phase by an interface formed by the intermingling of the particles within the aqueous suspensions. Typically, sheets produced in this manner have **non-heat seal**
fibrous covering the entire surface area of the sheet material on the surface in contact with the inclined fiber collecting screen 14 while the top of the sheet material has some **non-heat**
seal fibers and some heat seal fibers with the latter greatly

predominating. In this way there is not a clear line of demarcation between the two phases of the multi-phase sheet material; yet there is a predominance of heat seal thermoplastic material on the top surface or top phase 22 of the multi-phase sheet. The center or interface boundary, of course, is composed of a mixture of the two different types of fibers.

Although the technique or process described in the aforementioned U.S. Pat. No. 2,414,833 is preferably followed, the heat seal material used in preparing the heat seal phase of the sheet material is different. It is comprised of synthetic pulp fibrid-like particles. In view of the improved characteristics of such materials, including their high specific surface area, water insensitivity, low density, and smaller particle size, substantially improved seal strength characteristics under end use conditions can be achieved. These synthetic pulps are typically synthetic thermoplastic materials, such as polyolefins, having a structure more closely resembling wood pulp than synthetic fibers. That is, they contain a micro-fibrillar structure comprised of micro-fibrils exhibiting a high surface area as contrasted with the smooth, rod-like fibers of conventional synthetic man-made organic fibers. The synthetic thermoplastic pulp-like material can be dispersed to achieve excellent random distribution throughout the aqueous dispersing media in a paper-making operation and, consequently, can achieve excellent random distribution within the resultant sheet product. The pulps found particularly advantageous in the manufacture of infusion sheet materials are those made of the high density polyolefins of high molecular weight and low melt index.

The fibrils can be formed under high shear conditions in an apparatus such as a disc refiner or can be formed directly from their monomeric materials. Patents of interest with respect to the formation of fibrils are the following: U.S. Pat. Nos. 3,997,648, 4,007,247 and 4,010,229. As a result of these processes, the resultant dispersions are comprised of fiber-like particles having a typical size and shape comparable to the size and shape of natural cellulosic fibers and are commonly referred to as "synthetic pulp". The particles exhibit an irregular surface configuration, have a surface area in excess of one square meter per gram, and may have surface areas of even 100 square meters per gram. The fiber-like particles exhibit a morphology or structure that comprises fibrils which in turn are made up of micro-fibrils, all mechanically inter-entangled in random bundles generally having a width in the range of 1 to 20 microns. In general, the pulp-like fibers of polyolefins such as polyethylene, polypropylene, and mixtures thereof have a fiber length well suited to the paper-making technique, e.g., in the range of 0.4 to 2.5 millimeters with an overall average length of about 1 to 1.5 millimeters. Typical examples of these materials are the polyolefins sold by Crown Zellerbach Corporation under the designation "FYBREL", by Solvay and Cie/Hercules under the designation "LEXTAR" and by Montedison, S.P.A. and others.

Since the pure polyolefin particles are hydrophobic and have a surface tension that does not permit water wettability, the material obtained commercially is frequently treated to improve both wettability and dispersibility in aqueous suspensions. The amount of wetting agent added, however, is relatively small, and generally is less than 5 percent by weight, e.g., about 3 percent by weight and less. The chemically inert polyolefins are thermoplastic materials that become soft with increasing temperature; yet exhibit a true melting point due to their crystalinity. Thus, synthetic pulps of polyethylene exhibit a melting point in the range of 135.degree. C. to 150.degree. C. depending on the composition and surface treatment of the material.

Typically, the fiber composition of the heat seal phase is such that it contains cellulosic paper-making fibers in addition to the heat seal

fibers. In this connection, it has been found that for optimum results it is preferred that the heat seal component constitute approximately 70 to 75 percent of the fiber composition within the heat seal fiber slurry. As will be appreciated, variations in the amount of heat seal material will depend on the specific material utilized as well as the source of that material. However a sufficient amount of heat seal particles must be employed to provide satisfactory heat seal conditions in the end product. Consequently, it is preferred that about 60 to 80 percent of the fibers in the heat seal fiber suspension be of a thermoplastic heat seal type in order to provide the necessary characteristics.

It should be noted that the preferred heat seal polymers are those which have already received approval for use in food and beverage applications. Consequently, the synthetic pulp made from polyolefins and vinyon are the preferred materials while other materials may be used for different end use applications. As will be appreciated, the remaining fibers may be of a wide variety depending upon the end use of the fibrous web material. However, for infusion packages having application in the food and beverage field, it is preferable to employ approved natural or man-made fibers and preferably cellulosic natural fibers, for example, fibers of bleached or unbleached kraft, manila hemp or jute, abaca and other wood fibers. A variety of infuser web materials may be made from these fibers and utilized in accordance with the present invention. However, for ease of understanding and clarity of description, the invention is being described in its application to porous infusion web materials for use in the manufacture of **tea bags** and the like.

As mentioned, the present invention involves opening or enhancing the water permeability of the heat seal phase of a multi-phase sheet material. This can be achieved by altering, disrupting or displacing the heat seal fibers within the heat seal phase prior to the conventional heat drying operation. Although this can be accomplished in numerous different ways, such as by the entrapment and melting of ice particles, or by the use of decomposable particles, air bubbles and the like, it is preferred in accordance with the present invention to achieve the disruptive relocation within the heat seal phase by the use of a light water spray or mist directed onto the heat seal phase, preferably as the initially formed fibrous web material leaves the headbox of a paper-making machine. As is known to those skilled in the paper-making art, the fibrous web material leaving the headbox consists predominantly of dispersing medium with the fibers constituting only a minor portion, that is, less than 20 percent by weight, and typically less than 15 percent of the web material at this stage in its formation. In other words, the fiber consistency has changed from a level of about 0.01-0.05 percent by weight within the headbox to a fiber consistency of about from 1 to 2 percent by weight to 8 to 12 percent by weight on the web forming wire. At this stage, the newly formed fibrous web material is highly succeptible to fiber re-arrangement without adversely affecting the fiber to fiber bonding within the resultant fibrous product. Accordingly, by directing low impact mist-like spray droplets onto the sheet material immediately after it is formed the mist droplets act as if they are falling into a viscous liquid and do not penetrate deeply into the web, disrupting only the heat seal layer and leaving undisturbed the fibers of the base web material.

Preferably, the spray head generating the mist, such as a spray nozzle 30 is located adjacent the lip of the heat seal tray or headbox and the spray is angled slightly away from the vertical toward the wire 14 so that any large water droplets falling from the nozzle will fall harmlessly into the undeposited fiber dispersion within the headbox rather than on the partially dewatered fibrous web material. By positioning the mist spray head at this location, the mist water

droplets impact on the partially dewatered fibrous web material between its final formation point upon emergence from the headbox and the suction slot 32 of the paper-making machine where the formed but partially dewatered fibrous web material is subject to a vacuum designed to significantly reduce the water content of the web and facilitate removal of the web from the web forming wire.

Since large water droplets will have the effect of not only removing the heat seal fibers but also a substantial portion of the base phase thereby causing an unsightly disruption in the web, it is preferred that the spray nozzle be selected and that the water pressure be controlled so as to produce a large array of small droplets. The spray can by synchronized with the speed of the paper-making machine so that the very small water drops of a mist consistency having a low impact will impinge on the web at a controlled rate. By suitable choice of the nozzle, the impact force of the water droplets are controlled to produce a disruptive effect on the fibrous web material which affects only the upper portion or heat seal phase of the fibrous web material, leaving the lower or support phase substantially unaffected.

In the preferred embodiment, it has been found that a low impact spray nozzle provides the desired mist-like spray conditions. The low impact type of spray helps to avoid disturbing the base web fibers of the multi-phase sheet material. Multiple spray heads are preferably used and are spaced transversely across the headbox of the paper-making machine. High performance, low output, finely atomizing spray heads operate effectively with minimum water pressure such as mill supply water at 40-45 psi, to provide the preferred spray design such that the mist-like atomized spray impinges on the newly formed web material. In a typical arrangement the nozzles are located approximately six inches apart across the width of the headbox and are spaced from the web forming wide by a distance of about eighteen inches.

A spray head that has been found particularly effective is the hollow cone type designated "MB-1" and sold by Buffalo Forge Company of New York. When operated at a low water pressure of about 40 psi, the 1/8 inch orifice diameter nozzle provides a spray cone angle of about 45 to 50 degrees and a throughput in the range of approximately 0.2-1.0 liter per minute of water through each spray head. Due to the low water pressure conditions and the highly atomized droplets formed by the hollow cone spray head, the resultant water droplets impinging on the heat seal layer of the newly formed heat seal phase are of a fine or minute droplet size. The actual size of the droplets are difficult to measure but based on the sizes of the craters formed by the drops it is believed they generally fall within the range of about 50-5000 microns in diameter, with the preferred droplet size being approximately 200-2000 microns.

Due to the high water content of the fibrous web material prior to reaching the suction box 32, the water droplets will tend to displace the fibers, pushing them to the outer edge of the drop and forming small shallow craters in the sheet material, as shown at 34 in FIGS. 2 and 3. The dislodged and displaced fibers within the heat seal phase are pushed to the periphery of the craters by the droplets, as shown at 36 of FIG. 3, leaving an area substantially free of heat seal fibers within the central portion 38 of each crater. Although this results in a sheet material initially having a mottled effect, the small size of the craters i.e., 0.2-2 mm, and the subsequent heat drying operation avoid any unsightly appearance in the resultant web material. In this connection, heat seal **tea bag** paper is conventionally given a heat treatment during its manufacture to dry and partially adhere the heat sealable fibers within the upper phase to the base web fibers in order to provide the desired integrated web structure. During this heat treatment, synthetic pulp fibers become

transparent and the slightly mottled effect resulting from the mist spray becomes almost entirely unobservable. However, if the mist spray is of such a force and size so as to also disrupt the base fiber layer, then the disruption thus produced will be discernable even after the heat drying of the synthetic pulp fibers within the heat seal phase.

As will be appreciated, the craters formed by the water droplets will be present in a random array on the surface of the heat seal material. The size and concentration of the craters will vary substantially depending on the type of spray head and the impact force with which the water droplets strike the web material. Generally, it is preferred that the water droplets create a sufficiently large number of small discrete craters so that the craters occupy up to but less than about 75 percent of the total exposed surface area of the material. In this connection, it is important to assure that a sufficient distribution of heat seal fibers remains so as to provide the necessary heat sealing function. Typically, the craters are present throughout the entire planar extent of the heat seal phase at a concentration of at least about 40 per square centimeter of surface area, and occupy a minimum of about 10 percent of the total exposed surface area of the heat seal phase. An average crater density or concentration is about 60 to 80 craters per square centimeter occupying about 40-55 percent of the total exposed surface area. The craters formed by the impact of the spray drops have a shallow depth and, as indicated, a relatively random pattern that may vary depending on the particular shower head used to form the mist-like spray. Consequently, two adjacent craters may partially overlap as illustrated at 40 in FIG. 2. Additionally, the linear speed of the web forming wire will have an effect on the shape of the crater although the primary effect of machine speed is on the concentration and number of craters per unit of area of the sheet material. In this connection a web formed at 75 fpm linear speed will be impacted by about 7-30 ml of spray per square foot of web to provide the desired crater concentration.

The craters will vary in size and in configuration although most will be circular and typical of the configuration formed as a result of the spray droplets impinging on the readily displacable fibers in the heat seal phase of the sheet material. Typically, the craters will exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters while the individual craters will vary in surface area from about 3.times.10.sup.-1 to 3.times.10.sup.-4 square centimeters. Although the small size of the craters prevents accurate measurements, the craters naturally vary in size with the size of the droplets. Typically the average planar area of each crater falls within the range of 1 to 9.times.10.sup.-3 square centimeters. The diameter of the resultant craters typically falls within the range of 0.04 to 0.2 centimeters, with the average crater diameter being about 0.07 centimeters.

Not only may the production rate alter the size, concentration, and population of the resultant craters, but also the particular shower head can permit substantial variation in the size and pattern of the water droplets used to form the craters since those nozzles can be fitted with interchangeable shower discs. As indicated, however, the primary object of the spray is not simply to create a crater-like impression in the web, but rather to displace some of the fibers in the heat seal phase to provide an area of improved receptivity to water permeability and therefore improved infusion characteristics.

As mentioned hereinbefore, the water permeability of the heat seal web can be enhanced further by the utilization of chemical treatments. In particular, it has been found that the heat seal hydrophobic layer can be treated with surface active agents or surfactant systems to improve the wettability and water permeability of the heat seal phase, even after that phase has been opened by the crater forming technique

described hereinbefore. The treatment with the chemical surfactant is not such as to produce a chemical reaction but rather is more in the nature of an alteration in the surface characteristics of the fibrous web material, particularly the wetting characteristics. It is believed that the surface active agent or surfactant will affect the surface tension so as to alter the contact angle between the infusing liquids and the synthetic pulp particles. The contact angle is the angle between a surface and the tangent to a drop of water which has been applied to the surface at its point of contact with the surface. The theory of contact angles and their measurements are well known to those skilled in the art.

The surface active agents can be conveniently classified as anionic, cationic, nonionic and amphoteric. The materials are characterized structurally by an elongated non-polar portion having little affinity for water or water soluble systems and a short polar portion possessing high affinity for water and water soluble systems. The polar portion is hydrophilic and the non-polar portion is lipophilic (hydrophobic). Although different surfactants may be used for different applications, it has been found that nonionic materials having an appropriate hydrophile/lipophile balance (HLB) are preferred for food and beverage uses such as **tea bag** and similar infusion materials.
The most consistent feature of the effective surfactants is that they are nonionic, usually containing a polyoxyethylene group. The nonionic surface active agents do not dissociate in water but nevertheless are characterized by a relatively polar portion and non-polar portion and are the only class of surfactants that can be assigned an HLB number. Materials having HLB numbers from about 10 to 28 appear to work well. However, even among otherwise acceptable surfactants it is necessary that the material meet FDA approval and be free of adverse taste effects. Many surfactants give a strong mouth feel and leave a foamy, plastic or bitter aftertaste. As mentioned, the preferred surfactants are those that contain polyoxyethylene groups and among these, materials such as the polyoxyethylene (20) sorbitan monostearate (HLB-14.9) sold under the trademark "Tween-60" by ICI America have given best results particularly in the taste test. Blends of two or more agents also may be used.

Typically, the surfactant is added to the sheet material after formation and conveniently can be applied as a dilute solution (1 percent) of the agent. Such an operation will generally result in the addition of 0.1-0.6 percent of the surface active agent based on the dry fiber weight with 0.3 percent being preferred. It may be applied at various stages in the paper-making process, even while it is still on the forming wire, or later by size press or at the wind up reels. Application at the wet end can result in very poor retention of the agent and/or lowering of the internal bonding strength or tensile properties of the finished paper so that, preferably, the material is applied to the formed and dried web. This can be achieved by spraying or size pressing the web with a large amount of the solution containing a low concentration of surface active agent followed by subsequent drying. This leads to a uniform distribution of the surface active agent through the web. Of course other well known alternative methods of applying the material prior to the take up reel using a small amount of high concentration solution or by calendar stack application may be used. The preferred method is to spray the dry sheet material with a one percent solution of the surface active agent between two drying sections of the paper-making machine using a very coarse spray to obtain high absorption efficiency. The surface active agent employed to produce the desired effect is limited not only to those which have FDA approval for the particular end use and have minimal effect on taste, but also to those that will show maximum effect at a minimum application level.

As mentioned, it has been found that the use of synthetic pulps, while

providing improved seal strength characteristics, are deficient with respect to wettability and infusion properties. The expression "wettability" refers to the speed and uniformity of water abdsorption by the paper under end use conditions. Thus upon immersion of the material non-wetted or poorly wetted areas of the sheet are easily observed as opaque white areas while the thoroughly wetted areas immediately become transparent. A poorly wettable paper, therefore, produces an aesthetically displeasing appearance and can be readily noted while a paper exhibiting good wettability characteristics will rapidly absorb water and exhibit a uniform appearance. "Infusion" refers to the rate at which water can pass into the **tea bag** and **tea** liquor can pass out of the **tea bag** as well as the degree of extraction which is able to take place within a specified time. This is usually reported in terms of "first color" and "percent transmittance", respectively. When testing for first color a **tea bag** made from the material to be tested is carefully placed in quiet distilled water after the water has been brought to a boil. Using a stopwatch the time is recorded at which the first amber stream appears at the bottom of the sample. A first color time of about 5-6 seconds is considered indicative of good infusion characteristics. The percent transmittance test is conducted by measuring the transmittance of the brew after a 60 second steep time using a Markson Colorimeter Model T-600 at a wavelength of 530 m.mu. and using a 1 cm. cell. A target value for good infusion is in the mid-sixty percentile range with transmittance decreasing as infusion improves.

The following samples are given in order that the effectiveness of the present invention may be more fully understood. These examples are set forth for the purpose of illustration only and are not intended in any way to limit the practice of the invention. All parts are given by weight.

EXAMPLE I

This example shows the improved infusion characteristics obtained by using the process of the present invention.

A base phase fiber dispersion was prepared from about 75 percent hemp fibers and 25 percent wood fibers and a separate heat seal fiber dispersion was prepared using a fiber formulation comprising 75 percent polyethylene synthetic pulp FYBREL.RTM. E-400 and 25 percent kraft wood pulp. Using these dispersions a two phase heat seal sheet material was formed on a paper-making machine operated at a linear speed of about 75 feet per minute to provide a web material having a basis weight of about 16.5 grams per square meter. As the sheet emerged from the headbox, it was treated with a fine mist water spray directed toward the wet fibrous web at a location of about 1 inch from the stock dam. The spray nozzle was of the hollow cone type, Model MB-1 with a 1/8 inch orifice located about 18 inches from the web at a pressure of about 40 psi. The sheet material thus produced was dried on steam heated can dryers and was subject to an airless spray of a 0.16 percent solution of polyoxyethylene (20) sorbitan monostearate surfactant (Tween-60). The resultant material was designated Sample 1-A.

For comparison purposes, a second web material was produced in the identical manner as Sample 1-A from the same fiber dispersions except that the web was not subject to the mist spray and did not receive the surfactant treatment. The second material was designated 1-B.

These web materials were tested for infusion characteristics and wettability and the results were compared with the properties of a commercial grade of heat seal **tea bag** paper designated Sample 1-C. The results are reported in Table 1. The first color and percent transmittance data is the average of four separate

tests conducted in the manner set forth hereinbefore.

TABLE I

Sample No.	First Color (sec)	Transmittance (%)	Wettability
1-A	6.0	67.3	good
1-B	7.8	73.0	poor
1-C (control)	5.8	65.8	good

EXAMPLE II

The procedure of Example I was repeated except that a change was made in the type of synthetic pulp used in the heat seal layer. The FYBREL.RTM. was replaced by a synthetic pulp called "Pulpex" sold by Solvay and Cie. Sample 2-A is the material treated with the mist spray and surfactant while Sample 2-B is the identical material without the mist or surfactant treatments. Once again, the average of four tests are reported in the table.

TABLE II

Sample No.	First Color (sec)	Transmittance (%)	Wettability
2-A	8.0	70.3	good
2-B	9.0	77.8	poor

As can be seen the treatment according to the present invention provided substantial improvement in the infusion and wettability properties.

EXAMPLE III

This example illustrates the effect of the mist spray treatment on the infusion characteristics of a two phase heat seal material with and without the surfactant treatment.

In this example, the procedure of Example 1 was repeated. Sample 3-A was treated by both the mist spray and surfactant while Sample 3-B is identical except that the surfactant treatment was omitted. Sample 3-C was prepared from the same fiber furnish but received no mist spray and no surfactant. Sample 3-D is a control sheet of a typical commercial two phase heat seal web material.

TABLE III

Sample No.	First Color (sec)	Transmittance (%)	Wettability
3-A	5.8	65.0	good
3-B	5.5	66.7	poor
3-C	7.5	69.2	poor
3-D (control)	5.5	64.7	good

As will be apparent to persons skilled in the art, various

modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

CLM What is claimed is:

1. In a wet papermaking process for preparing a light weight multiphase heatsealable fibrous web material having excellent infusion characteristics comprising the steps of forming a dilute dispersion of heatsealable fibers in an aqueous dispersing medium; providing a fibrous substrate phase of non-heatsealing character; depositing said dispersion on said substrate phase while simultaneously removing a sufficient portion of said dispersing medium to form a partially dewatered heatsealable fiber phase superimposed on said substrate phase, said partially dewatered heatsealable phase having a fiber consistency of at least about one percent by weight with the remainder being substantially dispersing medium; and subsequently drying the resultant multi-phase web material to remove the dispersing medium and firmly secure the superimposed heatsealable phase to said substrate phase, the improvement wherein the heatsealable fibers are highly fibrillated synthetic thermoplastic particles and the process includes the step of disruptively dislodging and displacing portions of the heatseal particle in the partially dewatered heatseal fiber phase while superimposed on the fibrous substrate and prior to removing a major portion of the dispersing medium initially retained within said superimposed phase to provide a random array of discrete areas of reduced heatseal particle content and enhanced infusion in said multi-phase web material, the enhanced infusion areas being present throughout said heatseal phase at a concentration sufficient to occupy about 10-75 percent of the planar surface area of said heatseal fiber phase having an average diameter per area of up to 5 mm and an average planar area of at least 1.times.10.sup.-3 cm.sup.2 and being substantially invisible in the dried web material, said substrate phase being substantially unaffected by the displacement of portions of the heatseal phase and being itself substantially unmodified.

2. The process of claim 1 wherein said infusion areas of reduced heatseal particle content have an average concentration of at least about 40 per sq. cm.

3. The process of claim 1 wherein the step of dislodging and displacing the heatseal phase includes treating the partially dewatered phase with a low impact mist-like liquid spray to form a random array of a large number of small high infusion areas of reduced thermoplastic particle content in the form of discrete shallow craters.

4. The process of claim 3 wherein the low impact liquid spray to dislodge and displace the heatseal particles and form the random array of a large number of small, high infusion areas of reduced heatseal particle content in the form of discrete shallow craters having an average planar area per crater of about 3.times.10.sup.-4 to 3.times.10.sup.-1 sq. cm. and an average diameter in the range of 0.05-5 mm., the process including the step of treating the heatseal phase with a surfactant.

5. The process of claim 4 wherein the finely atomized spray is formed using a high performance hollow cone type spray head and the craters occupy about 40-55 percent of the total surface area of the heatseal phase and have an average diameter of about 0.7 mm.

6. The process of claim 1 wherein the thermoplastic particles are a synthetic pulp comprised of high density polyolefin having a molecular weight greater than 40,000 and a melt index less than 0.1, the particles being of high specific surface area, low density and small particle size; the discrete areas being shallow craters having an average planar

diameter in the range of 0.2-2 mm. and an average concentration of at least about 40 per sq. cm.

7. The process of claim 6 wherein the average concentration of craters is about 60-80 per sq. cm.

8. In a lightweight fibrous multi-phase heatsealable infusion web material comprising a non-heatseal fiber phase, a coextensive heatseal fiber phase superimposed thereon and an interface of intermixed non-heatseal and heatseal fibers secured between said phases, the improvement wherein said heatseal fiber phase and interface is provided with a large number of small, discrete physically modified high infusion areas of substantially reduced heatseal fiber content in the form of shallow craters that are substantially invisible in the dry web material, said high infusion areas occupying about 10-75 percent of the surface area of said heat-seal fiber phase having an average diameter per area up to 5 mm and an average planar area of at least 1.times.10.sup.-3 cm.sup.2, said underlying nonheatseal fiber phase being substantially free of associated areas of reduced fiber content.

9. The web material of claim 8 wherein the discrete shallow craters have an average planar area per crater in the range of about 3.times.10.sup.-4 to 3.times.10.sup.-1 sq. cm. and an average concentration of at least about 40 per sq. cm.

10. The web material of claim 8 wherein the heatseal fibers comprise synthetic pulp and the small shallow craters have an average diameter in the range of 0.05-5 mm.

11. The web material of claim 10 wherein the periphery of each crater has a higher synthetic pulp content than the non-crated planar portions of the heatseal phase, some of said craters being essentially free of heatseal fibers at their base so as to expose portions of said underlying nonheatseal phase.

12. The web material of claim 8 wherein the discrete shallow craters occupy 40-55 percent of the total surface area, the craters having an average planar area per crater in the range of about 1.times.10.sup.-3 to 9.times.10.sup.-3 sq. cm. at an average concentration of at least about 40 per sq. cm., said craters having an average diameter in the range of 0.2-2 mm.

13. The web material of claim 8 wherein the heatseal fibers comprise fibrillated thermoplastic synthetic pulp of high specific surface area and low density.

14. The web material of claim 13 wherein the synthetic pulp is comprises of high density polyolefin having a molecular weight greater than 40,000 and a melt index less than 0.1.

15. The web material of claim 8 containing a sufficient amount of surfactant to provide substantially uniform wettability within the heatseal phase of the web material.

16. The web material of claim 8 containing at least about 0.1 percent by weight of a nonionic surfactant containing a polyoxyethylene group, said surfactant being FDA approved for food contact applications, having a minimal effect on taste and providing substantially uniform wettability of the dried web material.

17. The web material of claim 16 wherein the surfactant is polyoxyethylene (20) sorbitan monostearate.

INCL INCLM: 162/109.000

```
       INCLS: 162/115.000; 162/129.000; 162/146.000; 162/208.000
NCL    NCLM:  162/109.000
       NCLS:  162/115.000; 162/129.000; 162/146.000; 162/208.000
IC     [3]
       ICM: D21H005-02
EXF    162/115; 162/116; 162/146; 162/129; 162/208; 162/210; 162/109; 428/171;
       428/286; 428/288
ARTU   173
CAS INDEXING IS AVAILABLE FOR THIS PATENT.


=> d 2 it

L3   ANSWER 2 OF 2  USPATFULL
IT    Tea
        (bags for, polyolefin fiber web-overlaid paper for)
IT    Polyolefin fibers
        (webs, paper overlaid with, for manuf. of tea bags)
IT    Bags
        (paper, polyolefin fiber web-overlaid, for tea, heat-sealable)
IT    9002-88-4
        (fiber, paper overlaid with, for manuf. of tea bags)
IT    9005-67-8
        (polyolefin fiber web-overlaid paper treated with, tea bags from)


=> file .1771textile
COST IN U.S. DOLLARS                                   SINCE FILE      TOTAL
                                                            ENTRY    SESSION
FULL ESTIMATED COST                                         36.56      38.36

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     (FILE 'HOME' ENTERED AT 09:28:13 ON 15 OCT 2001)

     FILE 'USPATFULL' ENTERED AT 09:35:24 ON 15 OCT 2001
L1          3247 S (TEA OR COFFEE)(L)BAG?
L2            14 S NON HEAT SEAL
L3             2 S L1 AND L2

     FILE 'TEXTILETECH, WTEXTILES, PIRA, CAPLUS' ENTERED AT 09:50:57 ON 15 OCT
     2001

=> s l1
L4           851 L1

=> s l2
L5             1 L2

=> s l1 and l2
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L6          0 L1 AND L2

=> d l5 1 all

L5     ANSWER 1 OF 1  WORLD TEXTILES  COPYRIGHT 2001 Elsevier Science B.V.
AN     2000:1995995    WTEXTILES
TI     Porous web material
IN     Gbur I.; Tomkinson B.; Alston J.; J. R. Crompton Limited
CS     I. Gbur, Lancashire, United Kingdom.
SO     U.S. Patent and Trademark Office, (2000), -/WEEK 44
       Priority Information: United Kingdom, 9515617, 29 Jul 1995, United
       Kingdom, 9523162, 13 Nov 1995
DT     Journal; Patent
CY     United States
LA     English
SL     English
AV     EMDOCS
AB     A fibrous, porous web material of the non-heat
       seal tissue having a basis weight of 9-18 gm-2 and comprises a
       first layer and a second layer juxtaposed thereto wherein the second
       layer. The first layer comprising vegetable fibers and a second layer
       comprising hardwood fibers, the second layer has a smaller pore size than
       the first layer. The paper is useful for producing beverage infusion bags
       (e.g. teabags) from which there is minimal passage of fine particles from
       the bags into their packaging.
CC     903 World Textiles: Related Topics
CT     papermaking


=> s crimp?
L7       13620 CRIMP?

=> s l4 and l7
L8           2 L4 AND L7

=> d 1 all

L8    ANSWER 1 OF 2  PIRA  COPYRIGHT 2001 PIRA
AN    92:16949  PIRA
DN    07-93-00314
TI    PATENT SCAN
AU    Anon
SO    Nonwovens Rep. Int., (1992) no. 259, Oct. 1992, p. 11.
DT    JOURNAL
LA    ENGLISH
FS    07; NW
AB    Amongst recently registered patents is UK company J R Crompton plc's
      method and equipment for creating patterned wet-laid tea
      bag materials. The US Milliken Research Corp. has invented a
      technique for making a cut-pile nonwoven. Kimberly-Clark Corp. has
      introduced a process for the production of a meltblown web based on epoxy
      and polycaprolactone. A new stretchable olefin nonwoven comes from Japan's
      Chisso Corp. and UniCharm. James River Corp. has discovered a new method
      for creating three-layer composites and has also been awarded a patent for
      a wet-laid hydroentanglement development. A new spunbonded construction of
      crimped bicomponent filaments and crystalline polypropylene
      filaments comes from Mitsui Petrochemical Industries Inc.
CC    Web Formation; Bonding Systems; Composites; 7151;7152;7160
CT    BICOMPONENT; COMPANY; COMPOSITE; CRIMP; CRYSTALLINITY; EPOXY;
      MELT-BLOWN; METHOD; NEW; NEW EQUIPMENT; NEW PROCESS; NEW PRODUCT;
      NONWOVEN; OLEFIN; PATENT; POLYCAPROLACTONE; POLYPROPYLENE; SCAN;
      SPUNBONDED; SPUNLACED; STRETCHABLE; TEA BAG; TECHNIQUE; WEB;
      WET-LAID
CO    CHISSO CORP.; CROMPTON JAMES R. AND BROS LTD; JAMES RIVER CORP.;
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KIMBERLY-CLARK CORP.; MILLIKEN RESEARCH CORP.; MITSUI PETROCHEM KK; UNICHARM
GT ASIA; EUROPE; JAPAN; NORTH AMERICA; UNITED KINGDOM; USA; AS;EU;ASJAP;NA;EZUKM;NAUSA
RN 9003-07-0 (POLYPROPYLENE)
61788-97-4 (EPOXY)
24980-41-4Q, 25248-42-4Q (POLYCAPROLACTONE)

=> d 2 all

L8 ANSWER 2 OF 2 CAPLUS COPYRIGHT 2001 ACS
AN 2001:174378 CAPLUS
DN 134:209234
TI Hydrophilic polyolefin fibers manufactured by treating polyolefin fibers with electric corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom
IN Yamashita, Kenji; Okaya, Hiroshi
PA Daiwa Spinning Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 8 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
IC ICM D06M010-04
ICS D04H001-42
CC 40-2 (Textiles and Fibers)
Section cross-reference(s): 17, 52, 63
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2001064867	A2	20010313	JP 1999-234736	19990820

AB The fibers comprise polyolefin fibers having the surface contg. finishing agents and showing ratio [(O/C)a] of O2 content of the surface to C content of the surface 0.11-0.40 and showing ratio [(O/C)w] of O2 content of the surface to C content of the surface 0.06-0.33 on removal of finishing agents from the fibers. The fibers (A) are prepd. by melt spinning polyolefins, drawing the fibers in H2O or drawing the fibers in the wet or dry state to form fiber bundles with H2O content .ltoreq.5%, passing the fiber bundles around a feed roll to form bundles with thickness .ltoreq.3 mm, treating the fibers with elec. corona, normal-pressure plasma, or aq. ozone solns. at yarn speed .gtoreq.10 m/min and yarn stretch ratio 1.0-1.2, and coating the fibers with finishing agents. Nonwoven fabrics comprise .gtoreq.30% A fibers. The fibers are useful for disposable diapers, sanitary napkins, wet tissues, filters, wipers, **tea bags**, and battery separators.
Polypropylene was melt spun at 270.degree. and 640 m/min, drawn to draw ratio 3.2 at 130.degree. to form fiber bundles with H2O content 0%, treated with elec. corona at 25.degree. and 1026 W/m2-min at yarn speed 10 m/min and yarn stretch ratio 1.05, immersed in a bath contg. dialkylsulfonic acid compd. (I) finish at 80.degree. to I content 0.3%, **crimped**, dried, and cut to give hydrophilic staple fibers with (O/C)a 0.24, (O/C)w 0.17, and tensile strength 4.6 cN/dtex and showing time required for wetting 0.3 g fibers (length 5 mm) 56 s as detd. by a specified testing. The hydrophilic fibers were made into a carded web and sprayed with H2O at 9.8 MPa using a nozzle to give a nonwoven fabric.
ST polyolefin fiber hydrophilic manufg; polypropylene fiber hydrophilic manufg; ethylene propylene copolymer fiber hydrophilic manufg; elec corona treatment polyolefin fiber hydrophilization; plasma treatment polyolefin fiber hydrophilization; ozone treatment polyolefin fiber hydrophilization; diaper polyolefin fiber hydrophilization; sanitary napkin polyolefin fiber hydrophilization; battery separator polyolefin fiber hydrophilization; **tea bag** polyolefin fiber hydrophilization
IT Sulfonic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)

(alkanesulfonic, finishes; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT **Tea** products
(**bags**; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT Polyolefin fibers
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ethylene, bicomponent with polypropylene fibers, nonwovens contg.; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content)

IT Polyolefin fibers
Polypropene fibers, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ethylene-propene, bicomponent with polypropylene fibers; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content)

IT Nonwoven fabrics
Wettability
(hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT Polyolefin fibers
Polypropene fibers, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT Disposable diapers
Filters
Primary battery separators
Secondary battery separators
(hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT Medical goods
(sanitary napkins; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT **Bags**
(**tea**; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT Electric corona
Plasma
(treatment by; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT Household furnishings
(wiping cloths; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

```
IT   9002-88-4, Polyethylene
     RL: TEM (Technical or engineered material use); USES (Uses)
        (fiber, bicomponent with polypropylene core, nonwovens contg.;
        hydrophilic polyolefin fibers manufd. by treating polyolefin fibers
        with elec. corona, plasma or ozone for fiber surface having specified
        oxygen content and carbon content)
IT   9010-79-1, Ethylene-propylene copolymer
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (fiber, bicomponent with polypropylene core; hydrophilic polyolefin
        fibers manufd. by treating polyolefin fibers with elec. corona, plasma
        or ozone for fiber surface having specified oxygen content and carbon
        content)
IT   25085-53-4, Isotactic polypropylene
     RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
     (Technical or engineered material use); PROC (Process); USES (Uses)
        (fiber; hydrophilic polyolefin fibers manufd. by treating polyolefin
        fibers with elec. corona, plasma or ozone for fiber surface having
        specified oxygen content and carbon content and nonwoven fabrics
        therefrom)
IT   10028-15-6, Ozone, reactions
     RL: RCT (Reactant)
        (treatment by; hydrophilic polyolefin fibers manufd. by treating
        polyolefin fibers with elec. corona, plasma or ozone for fiber surface
        having specified oxygen content and carbon content and nonwoven fabrics
        therefrom)


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COST IN U.S. DOLLARS                               SINCE FILE      TOTAL
                                                        ENTRY    SESSION
FULL ESTIMATED COST                                     34.06      72.42

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)         SINCE FILE      TOTAL
                                                        ENTRY    SESSION
CA SUBSCRIBER PRICE                                     -0.59      -0.59

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STN INTERNATIONAL LOGOFF AT 09:59:54 ON 15 OCT 2001


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COST IN U.S. DOLLARS                               SINCE FILE      TOTAL
                                                        ENTRY    SESSION
FULL ESTIMATED COST                                      0.63       0.63

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FILE COVERS 1907 - 2 Apr 2003  VOL 138 ISS 14
FILE LAST UPDATED: 1 Apr 2003  (20030401/ED)

  This file contains CAS Registry Numbers for easy and accurate
  substance identification.


=> s sinlgle(l)wet(l)laid(l)layer
              0 SINLGLE
         145897 WET
            978 WETS
         146773 WET
                  (WET OR WETS)
          11683 LAID
              1 LAIDS
          11683 LAID
                  (LAID OR LAIDS)
        1012489 LAYER
         454220 LAYERS
        1243455 LAYER
                  (LAYER OR LAYERS)
L1            0 SINLGLE(L)WET(L)LAID(L)LAYER

=> s single(l)layer
        1033753 SINGLE
           2527 SINGLES
        1035922 SINGLE
                  (SINGLE OR SINGLES)
        1012489 LAYER
         454220 LAYERS
        1243455 LAYER
                  (LAYER OR LAYERS)
L2        70684 SINGLE(L)LAYER

=> s wet(l)laid
         145897 WET
            978 WETS
         146773 WET
                  (WET OR WETS)
          11683 LAID
              1 LAIDS
          11683 LAID
                  (LAID OR LAIDS)
L3          791 WET(L)LAID

=> s l1 and l2
L4            0 L1 AND L2

=> s fibrous and (non-woven or un-woven or nonwoven or unwoven) and non-heat seal
and porous and web
          46458 FIBROUS
         585656 NON
```

```
             30 NONS
         585680 NON
                  (NON OR NONS)
          18422 WOVEN
             91 WOVENS
          18489 WOVEN
                  (WOVEN OR WOVENS)
           2019 NON-WOVEN
                  (NON(W)WOVEN)
          47600 UN
           1671 UNS
          49265 UN
                  (UN OR UNS)
          18422 WOVEN
             91 WOVENS
          18489 WOVEN
                  (WOVEN OR WOVENS)
             10 UN-WOVEN
                  (UN(W)WOVEN)
          26158 NONWOVEN
           2546 NONWOVENS
          26393 NONWOVEN
                  (NONWOVEN OR NONWOVENS)
            966 UNWOVEN
         585656 NON
             30 NONS
         585680 NON
                  (NON OR NONS)
        1095779 HEAT
          49671 HEATS
        1109409 HEAT
                  (HEAT OR HEATS)
          29753 SEAL
          16598 SEALS
          38131 SEAL
                  (SEAL OR SEALS)
              2 NON-HEAT SEAL
                  (NON(W)HEAT(W)SEAL)
         177812 POROUS
          21597 WEB
           5921 WEBS
          24199 WEB
                  (WEB OR WEBS)
L5            0 FIBROUS AND (NON-WOVEN OR UN-WOVEN OR NONWOVEN OR UNWOVEN) AND
                NON-HEAT SEAL AND POROUS AND WEB

=> s fibrous porous web
          46458 FIBROUS
         177812 POROUS
          21597 WEB
           5921 WEBS
          24199 WEB
                  (WEB OR WEBS)
L6            1 FIBROUS POROUS WEB
                  (FIBROUS(W)POROUS(W)WEB)

=> s fibrous(l) porous(l)web
          46458 FIBROUS
         177812 POROUS
          21597 WEB
           5921 WEBS
          24199 WEB
                  (WEB OR WEBS)
L7           99 FIBROUS(L) POROUS(L)WEB
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     (FILE 'HOME' ENTERED AT 09:54:57 ON 02 APR 2003)

     FILE 'CAPLUS' ENTERED AT 09:56:24 ON 02 APR 2003
L1            0 S SINLGLE(L)WET(L)LAID(L)LAYER
L2        70684 S SINGLE(L)LAYER
L3          791 S WET(L)LAID
L4            0 S L1 AND L2
L5            0 S FIBROUS AND (NON-WOVEN OR UN-WOVEN OR NONWOVEN OR UNWOVEN) AN
L6            1 S FIBROUS POROUS WEB
L7           99 S FIBROUS(L) POROUS(L)WEB

=> s infusion packaging web
         89669 INFUSION
         19646 INFUSIONS
         98140 INFUSION
                 (INFUSION OR INFUSIONS)
         59435 PACKAGING
          1399 PACKAGINGS
         59670 PACKAGING
                 (PACKAGING OR PACKAGINGS)
         21597 WEB
          5921 WEBS
         24199 WEB
                 (WEB OR WEBS)
L8           0 INFUSION PACKAGING WEB
                 (INFUSION(W)PACKAGING(W)WEB)

=> s infusion(l) packaging (l) web
         89669 INFUSION
         19646 INFUSIONS
         98140 INFUSION
                 (INFUSION OR INFUSIONS)
         59435 PACKAGING
          1399 PACKAGINGS
         59670 PACKAGING
                 (PACKAGING OR PACKAGINGS)
         21597 WEB
          5921 WEBS
         24199 WEB
                 (WEB OR WEBS)
L9           1 INFUSION(L) PACKAGING (L) WEB

=> d l6 bib,abs

L6   ANSWER 1 OF 1  CAPLUS  COPYRIGHT 2003 ACS
AN   1998:568966  CAPLUS
DN   129:177123
TI   Porous web material for teabags and bag manufacture
IN   Gbur, Ivan; Tomkinson, Brian; Alston, Joyce
PA   J.R. Crompton Limited, UK
SO   PCT Int. Appl., 20 pp.
     CODEN: PIXXD2
DT   Patent
LA   English
FAN.CNT 2
     PATENT NO.        KIND  DATE           APPLICATION NO.  DATE
     --------------    ----  --------       ---------------  --------
PI   WO 9836128         A1   19980820       WO 1998-GB311    19980212
         W:  AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE,
             DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG,
             KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX,
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            NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT,
            UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
        RW: GH, GM, KE, LS, MW, SD, SZ, UG, ZW, AT, BE, CH, DE, DK, ES, FI,
            FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM,
            GA, GN, ML, MR, NE, SN, TD, TG
     AU 9862202         A1    19980908      AU 1998-62202     19980212
     EP 963489          A1    19991215      EP 1998-904252    19980212
        R:  DE, FR, GB
     US 2002045302      A1    20020418      US 1999-257049    19990225
PRAI GB 1997-2857       A     19970212
     JP 1994-12150      A     19940108
     WO 1998-GB311      W     19980212
     US 1999-367427     A3    19991206
AB   A **fibrous, porous web** material of the heat
     seal type has improved particulate retention properties, for use in the
     manuf. of beverage infusion bags, i.e. teabags.  The web material
     comprises juxtaposed, successively wet laid first, second and third
     fibrous layers, .gtoreq.1 of the layers incorporating heat sealable
     (bonding) fibers.  The fibers in the first layer are of greater aspect
     ratio than those in the second layer which are of greater aspect ratio
     than those in the third layer.  A heat seal paper was produced as a first
     layer of polypropylene fiber, a second layer of softwood fiber, and a
     third layer of hardwood fiber.
RE.CNT  8      THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD
               ALL CITATIONS AVAILABLE IN THE RE FORMAT


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IND --------- Indexing data
IPC --------- International Patent Classifications
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PATS -------- PI, SO
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SCAN -------- CC, SX, TI, ST, IT (random display, no answer numbers;
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SIBIB ------- IBIB, no citations
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              containing hit terms
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HITSTR ------ HIT RN, its text modification, its CA index name, and
              its structure diagram
HITSEQ ------ HIT RN, its text modification, its CA index name, its
              structure diagram, plus NTE and SEQ fields
FHITSTR ----- First HIT RN, its text modification, its CA index name, and
              its structure diagram
FHITSEQ ----- First HIT RN, its text modification, its CA index name, its
              structure diagram, plus NTE and SEQ fields
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     FILE 'CAPLUS' ENTERED AT 09:56:24 ON 02 APR 2003
L1            0 S SINLGLE(L)WET(L)LAID(L)LAYER
L2        70684 S SINGLE(L)LAYER
L3          791 S WET(L)LAID
L4            0 S L1 AND L2
L5            0 S FIBROUS AND (NON-WOVEN OR UN-WOVEN OR NONWOVEN OR UNWOVEN) AN
L6            1 S FIBROUS POROUS WEB
L7           99 S FIBROUS(L) POROUS(L)WEB
L8            0 S INFUSION PACKAGING WEB
L9            1 S INFUSION(L) PACKAGING (L) WEB

=> d l9 bib,abs

L9   ANSWER 1 OF 1  CAPLUS  COPYRIGHT 2003 ACS
AN   1999:311351  CAPLUS
DN   130:326274
TI   Heat seal infusion web material and method of manufacture
IN   Byalik, Ludmila; Viazmensky, Helen
PA   Dexter Corporation, USA
SO   PCT Int. Appl., 22 pp.
     CODEN: PIXXD2
DT   Patent
LA   English
FAN.CNT 1
     PATENT NO.        KIND  DATE           APPLICATION NO.  DATE
     ---------------   ----  --------       ---------------  --------
PI   WO 9923306         A1   19990514       WO 1998-US22967  19981029
         W:  JP, US
         RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL,
             PT, SE
     EP 1027499         A1   20000816       EP 1998-957414   19981029
         R:  AT, BE, DE, ES, FR, GB, SE
     JP 2001522004      T2   20011113       JP 2000-519152   19981029
```

```
PRAI US 1997-64142P     P     19971031
     WO 1998-US22967    W     19981029
AB   A heat seal infusion packing material for such articles as tea bags and
     the like comprises natural fibers (softwood pulp) and .ltoreq.50% heat
     seal fibers (polyethylene fiber) which contains a portion of
     multicomponent thermoplastic fibers (polyethylene and polypropylene
     core-sheath fiber). The multicomponent heat seal fibers provide improved
     seal strength and infusion characteristics over a broad operational window
     while reducing the heat seal fiber concn. within the sheet material.
RE.CNT  3      THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD
               ALL CITATIONS AVAILABLE IN THE RE FORMAT


=> d his

     (FILE 'HOME' ENTERED AT 09:54:57 ON 02 APR 2003)

     FILE 'CAPLUS' ENTERED AT 09:56:24 ON 02 APR 2003
L1            0 S SINLGLE(L)WET(L)LAID(L)LAYER
L2        70684 S SINGLE(L)LAYER
L3          791 S WET(L)LAID
L4            0 S L1 AND L2
L5            0 S FIBROUS AND (NON-WOVEN OR UN-WOVEN OR NONWOVEN OR UNWOVEN) AN
L6            1 S FIBROUS POROUS WEB
L7           99 S FIBROUS(L) POROUS(L)WEB
L8            0 S INFUSION PACKAGING WEB
L9            1 S INFUSION(L) PACKAGING (L) WEB

=> s single (l)wet laid(l) layer
       1033753 SINGLE
          2527 SINGLES
       1035922 SINGLE
                 (SINGLE OR SINGLES)
        145897 WET
           978 WETS
        146773 WET
                 (WET OR WETS)
         11683 LAID
             1 LAIDS
         11683 LAID
                 (LAID OR LAIDS)
           526 WET LAID
                 (WET(W)LAID)
       1012489 LAYER
        454220 LAYERS
       1243455 LAYER
                 (LAYER OR LAYERS)
L10          3 SINGLE (L)WET LAID(L) LAYER

=> d l10 1-3 bib,abs

L10  ANSWER 1 OF 3  CAPLUS  COPYRIGHT 2003 ACS
AN   2002:566484  CAPLUS
DN   137:110618
TI   Thermal transfer image-receiving sheet
IN   Mitsuyasu, Naoyuki; Yamazaki, Masayasu; Yonetani, Shinji
PA   Dainippon Printing Co., Ltd., Japan
SO   Jpn. Kokai Tokkyo Koho, 6 pp.
     CODEN: JKXXAF
DT   Patent
LA   Japanese
FAN.CNT 1
     PATENT NO.        KIND  DATE          APPLICATION NO.  DATE
     --------------    ----  --------      --------------   --------
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PI   JP 2002212890     A2   20020731        JP 2001-1348     20010109
PRAI JP 2001-1348           20010109
AB   The sheet comprise a backing, a porous layer, an intermediate
     layer, and an image-receiving layer, where the backing
     is derived by wet laying of a pulp material, pressing the wet-
     laid sheet with a press part, and drying with a Yankee dryer.  A
     single side glossy paper was coated with a porous layer
     contg. acrylic hollow beads (Ropaque HP 1055) and poly(vinyl alc.) (I), an
     intermediated layer contg. polyester-polyurethane and I, a
     receiving layer contg. EVA, amino-modified silicone,
     epoxy-modified silicone, and a rear layer contg. I, giving an
     image-receiving sheet suppressing curl under high humidity.

L10  ANSWER 2 OF 3  CAPLUS  COPYRIGHT 2003 ACS
AN   2001:737197  CAPLUS
DN   135:290368
TI   Biodegradable heat-sealable paper with good resistance to boiling water
     and method for their manufacture
IN   Nakayama, Tadaaki; Fujimura, Michio; Nio, Shoichi
PA   Nankoku Pulp Industry Co., Ltd., Japan; Japan Paper Industry Co., Ltd.
SO   Jpn. Kokai Tokkyo Koho, 8 pp.
     CODEN: JKXXAF
DT   Patent
LA   Japanese
FAN.CNT 1
     PATENT NO.        KIND  DATE            APPLICATION NO.  DATE
     ---------------   ----  --------        ---------------  --------
PI   JP 2001279594     A2    20011010        JP 2000-88734    20000328
PRAI JP 2000-88734           20000328
AB   The paper is wet laid from a pulp slurry contg. 40-90%
     poly(L-lactic acid) fibers and composite poly(lactic acid) fibers at a wt.
     ratio of 1:1-4 and has a basis wt. of 7-40 g/m2.  The paper can be
     heat-sealed from 2 sides or laminated with a non-heat seal layer
     for forming a single side heat-sealable sheet.  Thus, wet laying
     a slurry contg. Terramac S 95 (composite polylactic acid fiber) 40,
     Terramac S 94 [poly(L-lactic acid) fiber] 10, Manila hemp fiber 20, wood
     pulp 30, Sumirez Resin 675 5 and Cellogen WS-C 1% gave a sheet with basis
     wt. 20 g/m2, which was calendered with hot roller at 160-170.degree. to
     give a heat-sealable sheet useful for processing into tea bags.

L10  ANSWER 3 OF 3  CAPLUS  COPYRIGHT 2003 ACS
AN   1992:132458  CAPLUS
DN   116:132458
TI   Multilayered sheets:  the media of the future for automotive filtration
     applications?
AU   Kaukopaasi, Jan G.; Shah, Naresh B.
CS   Ahlstrom Filtr. Inc., Chattanooga, TN, 37407-0009, USA
SO   Tappi Journal (1992), 75(1), 127-32
     CODEN: TAJODT; ISSN: 0734-1415
DT   Journal
LA   English
AB   The filtration performance wet-laid multilayer
     automotive filters is significantly improved over that of single
     layer filters.  The performance is improved when the layering
     direction is reversed.


=> log y
COST IN U.S. DOLLARS                                 SINCE FILE      TOTAL
                                                          ENTRY    SESSION
FULL ESTIMATED COST                                       80.32      80.95

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)           SINCE FILE      TOTAL
                                                          ENTRY    SESSION
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CA SUBSCRIBER PRICE	-3.26	-3.26

STN INTERNATIONAL LOGOFF AT 10:05:16 ON 02 APR 2003

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=> d his

     (FILE 'HOME' ENTERED AT 09:28:13 ON 15 OCT 2001)

     FILE 'USPATFULL' ENTERED AT 09:35:24 ON 15 OCT 2001
L1         3247 S (TEA OR COFFEE)(L)BAG?
L2           14 S NON HEAT SEAL
L3            2 S L1 AND L2

     FILE 'TEXTILETECH, WTEXTILES, PIRA, CAPLUS' ENTERED AT 09:50:57 ON 15 OCT
     2001

=> s l1
L4          851 L1

=> s l2
L5            1 L2

=> s l1 and l2
L6            0 L1 AND L2

=> d l5 1 all

L5    ANSWER 1 OF 1  WORLD TEXTILES  COPYRIGHT 2001 Elsevier Science B.V.
AN    2000:1995995   WTEXTILES
TI    Porous web material
IN    Gbur I.; Tomkinson B.; Alston J.; J. R. Crompton Limited
CS    I. Gbur, Lancashire, United Kingdom.
SO    U.S. Patent and Trademark Office, (2000), -/WEEK 44
      Priority Information: United Kingdom, 9515617, 29 Jul 1995, United
      Kingdom, 9523162, 13 Nov 1995
DT    Journal; Patent
CY    United States
LA    English
SL    English
AV    EMDOCS
AB    A fibrous, porous web material of the non-heat
      seal tissue having a basis weight of 9-18 gm-2 and comprises a
      first layer and a second layer juxtaposed thereto wherein the second
      layer. The first layer comprising vegetable fibers and a second layer
      comprising hardwood fibers, the second layer has a smaller pore size than
      the first layer. The paper is useful for producing beverage infusion bags
      (e.g. teabags) from which there is minimal passage of fine particles from
      the bags into their packaging.
CC    903 World Textiles: Related Topics
CT    papermaking


=> s crimp?
L7        13620 CRIMP?

=> s l4 and l7
L8            2 L4 AND L7

=> d 1 all

L8   ANSWER 1 OF 2  PIRA  COPYRIGHT 2001 PIRA
AN   92:16949  PIRA
DN   07-93-00314
```

TI PATENT SCAN
AU Anon
SO Nonwovens Rep. Int., (1992) no. 259, Oct. 1992, p. 11.
DT JOURNAL
LA ENGLISH
FS 07; NW
AB Amongst recently registered patents is UK company J R Crompton plc's method and equipment for creating patterned wet-laid **tea bag** materials. The US Milliken Research Corp. has invented a technique for making a cut-pile nonwoven. Kimberly-Clark Corp. has introduced a process for the production of a meltblown web based on epoxy and polycaprolactone. A new stretchable olefin nonwoven comes from Japan's Chisso Corp. and UniCharm. James River Corp. has discovered a new method for creating three-layer composites and has also been awarded a patent for a wet-laid hydroentanglement development. A new spunbonded construction of **crimped** bicomponent filaments and crystalline polypropylene filaments comes from Mitsui Petrochemical Industries Inc.
CC Web Formation; Bonding Systems; Composites; 7151;7152;7160
CT BICOMPONENT; COMPANY; COMPOSITE; **CRIMP**; CRYSTALLINITY; EPOXY; MELT-BLOWN; METHOD; NEW; NEW EQUIPMENT; NEW PROCESS; NEW PRODUCT; NONWOVEN; OLEFIN; PATENT; POLYCAPROLACTONE; POLYPROPYLENE; SCAN; SPUNBONDED; SPUNLACED; STRETCHABLE; **TEA BAG**; TECHNIQUE; WEB; WET-LAID
CO CHISSO CORP.; CROMPTON JAMES R. AND BROS LTD; JAMES RIVER CORP.; KIMBERLY-CLARK CORP.; MILLIKEN RESEARCH CORP.; MITSUI PETROCHEM KK; UNICHARM
GT ASIA; EUROPE; JAPAN; NORTH AMERICA; UNITED KINGDOM; USA; AS;EU;ASJAP;NA;EZUKM;NAUSA
RN 9003-07-0 (POLYPROPYLENE)
61788-97-4 (EPOXY)
24980-41-4Q, 25248-42-4Q (POLYCAPROLACTONE)

=> d 2 all

L8 ANSWER 2 OF 2 CAPLUS COPYRIGHT 2001 ACS
AN 2001:174378 CAPLUS
DN 134:209234
TI Hydrophilic polyolefin fibers manufactured by treating polyolefin fibers with electric corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom
IN Yamashita, Kenji; Okaya, Hiroshi
PA Daiwa Spinning Co., Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 8 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
IC ICM D06M010-04
ICS D04H001-42
CC 40-2 (Textiles and Fibers)
Section cross-reference(s): 17, 52, 63
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2001064867	A2	20010313	JP 1999-234736	19990820

AB The fibers comprise polyolefin fibers having the surface contg. finishing agents and showing ratio [(O/C)a] of O2 content of the surface to C content of the surface 0.11-0.40 and showing ratio [(O/C)w] of O2 content of the surface to C content of the surface 0.06-0.33 on removal of finishing agents from the fibers. The fibers (A) are prepd. by melt spinning polyolefins, drawing the fibers in H2O or drawing the fibers in the wet or dry state to form fiber bundles with H2O content .ltoreq.5%, passing the fiber bundles around a feed roll to form bundles with

thickness .ltoreq.3 mm, treating the fibers with elec. corona, normal-pressure plasma, or aq. ozone solns. at yarn speed .gtoreq.10 m/min and yarn stretch ratio 1.0-1.2, and coating the fibers with finishing agents. Nonwoven fabrics comprise .gtoreq.30% A fibers. The fibers are useful for disposable diapers, sanitary napkins, wet tissues, filters, wipers, **tea bags**, and battery separators.
Polypropylene was melt spun at 270.degree. and 640 m/min, drawn to draw ratio 3.2 at 130.degree. to form fiber bundles with H2O content 0%, treated with elec. corona at 25.degree. and 1026 W/m2-min at yarn speed 10 m/min and yarn stretch ratio 1.05, immersed in a bath contg. dialkylsulfonic acid compd. (I) finish at 80.degree. to I content 0.3%, **crimped**, dried, and cut to give hydrophilic staple fibers with (O/C)a 0.24, (O/C)w 0.17, and tensile strength 4.6 cN/dtex and showing time required for wetting 0.3 g fibers (length 5 mm) 56 s as detd. by a specified testing. The hydrophilic fibers were made into a carded web and sprayed with H2O at 9.8 MPa using a nozzle to give a nonwoven fabric.

ST polyolefin fiber hydrophilic manufg; polypropylene fiber hydrophilic manufg; ethylene propylene copolymer fiber hydrophilic manufg; elec corona treatment polyolefin fiber hydrophilization; plasma treatment polyolefin fiber hydrophilization; ozone treatment polyolefin fiber hydrophilization; diaper polyolefin fiber hydrophilization; sanitary napkin polyolefin fiber hydrophilization; battery separator polyolefin fiber hydrophilization; **tea bag** polyolefin fiber hydrophilization

IT Sulfonic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(alkanesulfonic, finishes; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT **Tea** products
(**bags**; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT Polyolefin fibers
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ethylene, bicomponent with polypropylene fibers, nonwovens contg.; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content)

IT Polyolefin fibers
Polypropene fibers, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ethylene-propene, bicomponent with polypropylene fibers; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content)

IT Nonwoven fabrics
Wettability
(hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT Polyolefin fibers
Polypropene fibers, uses
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT Disposable diapers
Filters

Primary battery separators
Secondary battery separators
(hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT Medical goods
(sanitary napkins; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT **Bags**
(**tea**; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT Electric corona
Plasma
(treatment by; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT Household furnishings
(wiping cloths; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom for)

IT 9002-88-4, Polyethylene
RL: TEM (Technical or engineered material use); USES (Uses)
(fiber, bicomponent with polypropylene core, nonwovens contg.; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content)

IT 9010-79-1, Ethylene-propylene copolymer
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(fiber, bicomponent with polypropylene core; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content)

IT 25085-53-4, Isotactic polypropylene
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(fiber; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

IT 10028-15-6, Ozone, reactions
RL: RCT (Reactant)
(treatment by; hydrophilic polyolefin fibers manufd. by treating polyolefin fibers with elec. corona, plasma or ozone for fiber surface having specified oxygen content and carbon content and nonwoven fabrics therefrom)

=> log y

COST IN U.S. DOLLARS	SINCE FILE ENTRY	TOTAL SESSION
FULL ESTIMATED COST	34.06	72.42

DISCOUNT AMOUNTS (FOR QUALIFYING ACCOUNTS)	SINCE FILE ENTRY	TOTAL SESSION
CA SUBSCRIBER PRICE	-0.59	-0.59

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LOGINID:sssptau155jjg
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 NEWS  1            Web Page URLs for STN Seminar Schedule - N. America
 NEWS  2  Dec 17   The CA Lexicon available in the CAPLUS and CA files
 NEWS  3  Feb 06   Engineering Information Encompass files have new names
 NEWS  4  Feb 16   TOXLINE no longer being updated
 NEWS  5  Apr 23   Search Derwent WPINDEX by chemical structure
 NEWS  6  Apr 23   PRE-1967 REFERENCES NOW SEARCHABLE IN CAPLUS AND CA
 NEWS  7  May 07   DGENE Reload
 NEWS  8  Jun 20   Published patent applications (A1) are now in USPATFULL
 NEWS  9  JUL 13   New SDI alert frequency now available in Derwent's
                   DWPI and DPCI
 NEWS 10  Aug 23   In-process records and more frequent updates now in
                   MEDLINE
 NEWS 11  Aug 23   PAGE IMAGES FOR 1947-1966 RECORDS IN CAPLUS AND CA
 NEWS 12  Aug 23   Adis Newsletters (ADISNEWS) now available on STN
 NEWS 13  Sep 17   IMSworld Pharmaceutical Company Directory name change
                   to PHARMASEARCH
 NEWS 14  Oct 09   Korean abstracts now included in Derwent World Patents
                   Index
 NEWS 15  Oct 09   Number of Derwent World Patents Index updates increased

 NEWS EXPRESS  August 15 CURRENT WINDOWS VERSION IS V6.0c,
               CURRENT MACINTOSH VERSION IS V6.0 (ENG) AND V6.0J (JP),
               AND CURRENT DISCOVER FILE IS DATED 07 AUGUST 2001
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 NEWS PHONE    Direct Dial and Telecommunication Network Access to STN
 NEWS WWW      CAS World Wide Web Site (general information)

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FILE 'HOME' ENTERED AT 09:28:13 ON 15 OCT 2001

=> file uspatfull
COST IN U.S. DOLLARS                              SINCE FILE     TOTAL
                                                       ENTRY   SESSION
FULL ESTIMATED COST                                     1.80      1.80

FILE 'USPATFULL' ENTERED AT 09:35:24 ON 15 OCT 2001
CA INDEXING COPYRIGHT (C) 2001 AMERICAN CHEMICAL SOCIETY (ACS)
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FILE COVERS 1971 TO PATENT PUBLICATION DATE: 11 Oct 2001 (20011011/PD)
FILE LAST UPDATED: 11 Oct 2001 (20011011/ED)
HIGHEST GRANTED PATENT NUMBER: US6249914
HIGHEST APPLICATION PUBLICATION NUMBER: US2001029620
CA INDEXING IS CURRENT THROUGH 11 Oct 2001 (20011011/UPCA)
ISSUE CLASS FIELDS (/INCL) CURRENT THROUGH: 11 Oct 2001 (20011011/PD)
REVISED CLASS FIELDS (/NCL) LAST RELOADED: Apr 2001
USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Apr 2001

>>> Page images are available for patents from 1/1/1998.  Patents    <<<
>>> and applications are typically loaded on the day of publication.<<<
>>> Page images are available for display by the following day.     <<<
>>> Image data for the /FA field are available the following update.<<<

>>> Complete CA file indexing for chemical patents (or equivalents) <<<
>>> is included in file records.  A thesaurus is available for the  <<<
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>>> fields.  This thesaurus includes catchword terms from the        <<<
>>> USPTO/MOC subject headings and subheadings.  Thesauri are also   <<<
>>> available for the WIPO International Patent Classification       <<<
>>> (IPC) Manuals, editions 1-6, in the /IC1, /IC2, /IC3, /IC4,      <<<
>>> /IC5, and /IC (/IC6) fields, respectively.  The thesauri in      <<<
>>> the /IC5 and /IC fields include the corresponding catchword      <<<
>>> terms from the IPC subject headings and subheadings.             <<<

This file contains CAS Registry Numbers for easy and accurate
substance identification.

=> s (tea or coffee)(l)bag?
         16455 TEA
           500 TEAS
         16641 TEA
                 (TEA OR TEAS)
         15007 COFFEE
           385 COFFEES
         15045 COFFEE
                 (COFFEE OR COFFEES)
        105056 BAG?
L1        3247 (TEA OR COFFEE)(L)BAG?

=> s non heat seal
       1115562 NON
            16 NONS
       1115566 NON
                 (NON OR NONS)
        699334 HEAT
         42382 HEATS
        704731 HEAT
                 (HEAT OR HEATS)
        325063 SEAL
        147466 SEALS
        362644 SEAL
                 (SEAL OR SEALS)
L2          14 NON HEAT SEAL
                 (NON(W)HEAT(W)SEAL)

=>

=> l1 and l2
L1 IS NOT A RECOGNIZED COMMAND
The previous command name entered was not recognized by the system.
For a list of commands available to you in the current file, enter
"HELP COMMANDS" at an arrow prompt (=>).
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WEST

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Search Results - Record(s) 1 through 11 of 11 returned.

☑ 1. Document ID: US 5431997 A Relevance Rank: 99

L2: Entry 2 of 11 File: USPT Jul 11, 1995

US-PAT-NO: 5431997

DOCUMENT-IDENTIFIER: US 5431997 A

TITLE: Process of producing porous web materials used for making infusion packages for brewing beverages and the web materials thus produced

DATE-ISSUED: July 11, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Scott; Peter C.	Enfield	CT	N/A	N/A
Viazmensky; Helen	South Windsor	CT	N/A	N/A
Wolcheck, Jr.; Nicholas	Suffield	CT	N/A	N/A

US-CL-CURRENT: 442/79; 206/5, 426/77, 426/84, 428/306.6, 428/308.8, 428/446, 428/449, 428/511, 442/81, 442/82

ABSTRACT:

A porous web material for making infusion packages having enhanced mechanical seam integrity is obtained by treating the entire fibrous web material with an aqueous emulsion of a hydrophobic agent selected from the group consisting of high molecular weight cross-linked acrylic polymers, silicones, fluorohydrocarbons, paraffins, alkyl ketene dimers and stearylated materials. The hydrophobic agent, which may also act as a strength imparting binder, is preferably applied as a saturating treatment. The treated web is subsequently dried to insolublize the agent on the web. The web exhibits no appreciable water climb when measured using water at a temperature of about 100.degree. C. and no substantial loss of infusion characteristics while providing less than 10 percent failure in a mechanical seam therein when exposed to boiling water.

16 Claims, 0 Drawing figures Exemplary Claim Number: 1

Full | Title | Citation | Front | Review | Classification | Date | Reference | KWIC | Draw Desc | Image

☑ 2. Document ID: US 4289580 A Relevance Rank: 95

L2: Entry 11 of 11 File: USPT Sep 15, 1981

US-PAT-NO: 4289580

DOCUMENT-IDENTIFIER: US 4289580 A

TITLE: Heat seal fibrous web and method of its manufacture

DATE-ISSUED: September 15, 1981

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Elston; Colin	Windsor	CT	N/A	N/A
Hoffman; Herbert A.	Longmeadow	MA	N/A	N/A
Murphy; H. Joseph	Longmeadow	MA	N/A	N/A

US-CL-CURRENT: 162/109; 162/115, 162/129, 162/146, 162/208

ABSTRACT:

Improved infusion web material for tea bags and the like is provided by using synthetic pulp in the heat seal phase and forming therein an array of a large number of small discrete craters. These craters, which exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters, are formed prior to drying the initially formed multi-phase material by directing a low impact mist-like liquid spray onto the heat seal phase. The droplets from the spray displace the fibers to form the shallow craters and, at times, expose portions of the underlying non-heat seal fiber phase. The small craters are present throughout the heat seal phase at a concentration of at least about 40 per square centimeter and occupy about 10-75 percent of the total exposed surface area of the heat seal fiber phase of the material. The web also is treated with a surfactant.

17 Claims, 3 Drawing figures Exemplary Claim Number: 1

Number of Drawing Sheets: 1

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

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☐ 3. Document ID: US 4458042 A Relevance Rank: 91

L2: Entry 10 of 11 File: USPT Jul 3, 1984

US-PAT-NO: 4458042
DOCUMENT-IDENTIFIER: US 4458042 A

TITLE: Absorbent material

DATE-ISSUED: July 3, 1984

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Espy; Herbert H.	Wilmington	DE	N/A	N/A

US-CL-CURRENT: 524/14; 162/142, 162/146, 162/169, 162/182, 524/13, 524/502, 524/543

ABSTRACT:

Disclosed is absorbent material composed of a consolidated blend of spurted polyolefin pulp, treated with an anionic or nonionic wetting agent substance having a molecular weight less than about 8000, and wood fluff pulp. The absorbent material exhibits a desirable combination of strength, rate of absorbency and total absorbency.

8 Claims, 0 Drawing figures Exemplary Claim Number: 1

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

☐ 4. Document ID: US 4882213 A   Relevance Rank: 91

L2: Entry 9 of 11   File: USPT   Nov 21, 1989

US-PAT-NO: 4882213
DOCUMENT-IDENTIFIER: US 4882213 A

TITLE: Absorbent article with tear line guide

DATE-ISSUED: November 21, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Gaddis; Paul G.	Renton	WA	N/A	N/A
Perdelwitz, Jr.; Lee E.	Tacoma	WA	N/A	N/A

US-CL-CURRENT: 428/136; 297/219.1, 297/229, 297/DIG.5, 428/137, 428/138, 428/156, 428/171, 428/172, 428/326, 428/43, 5/413R, 5/484, 5/487, 604/367, 604/379, 604/385.11, 604/393

ABSTRACT:

An absorbent article is described which may be formed at least in part of thermoplastic and other fibers. The article is densified along a first region and has a tear line defined in the first region. A second region of lower density than the first region is provided at the termination point of the tear line to assist in stopping tearing along the tear line. In addition, densified reinforcing regions can be provided outside areas where the tear line curves or switches directions. Perforations or cuts in the tear line may extend continuously around the corner of the tear line to assist tearing around the corner.

20 Claims, 6 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 2

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw. Desc | Image

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☐ 5. Document ID: US 4885200 A   Relevance Rank: 91

L2: Entry 8 of 11   File: USPT   Dec 5, 1989

US-PAT-NO: 4885200
DOCUMENT-IDENTIFIER: US 4885200 A

TITLE: Infant car seat liner

DATE-ISSUED: December 5, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Perdelwitz, Jr.; Lee E.	Tacoma	WA	N/A	N/A
Hanke; David E.	San Diego	CA	N/A	N/A

US-CL-CURRENT: 428/136; 297/219.12, 297/229, 297/DIG.5, 428/137, 428/138, 428/156, 428/171, 428/172, 428/192, 428/326, 428/903, 428/920, 5/483, 5/484, 5/487, 604/367, 604/378, 604/379, 604/381, 604/393

ABSTRACT:

A disposable infant seat liner in accordance with the present invention includes an upper section, a middle section and a lower section. Plural shoulder strap receiving slotways are provided in the upper section. These slotways may be accessible from side edges of the infant seat liner. In one embodiment, three shoulder strap receiving positions are provided at each side of the upper section to accommodate shoulder straps of various infant seat designs. First and second leg or crotch strap receiving slotways are also provided in a lower section of the infant seat liner. In one specific embodiment, a Y-shaped leg strap receiving slotway is positioned below an upwardly facing U-shaped slotway. In another embodiment, the lower slotway is T-shaped. Arched side cuts may also be provided in the central section of the infant seat liner to accommodate waist straps and to facilitate fitting of the infant seat liner to an infant car seat. The slotways, cuts and slits may be selectively openable with perforations being provided for this purpose. In this latter case, a user need only open those perforations required to fit the infant seat liner to the user's particular infant seat.

46 Claims, 10 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 4

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Drawi Desc | Image

6. Document ID: US 4886697 A   Relevance Rank: 91

L2: Entry 7 of 11   File: USPT   Dec 12, 1989

US-PAT-NO: 4886697
DOCUMENT-IDENTIFIER: US 4886697 A

TITLE: Thermoplastic material containing absorbent pad or other article

DATE-ISSUED: December 12, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Perdelwitz, Jr; Lee E.	Tacoma	WA	N/A	N/A
Young; Robert H.	Maple Valley	WA	N/A	N/A
Iff; Ron H.	Puyallup	WA	N/A	N/A
Hanke; David E.	San Diego	CA	N/A	N/A
Allison; Kathleen S.	Tacoma	WA	N/A	N/A
Rahkonen; Raimo K.	Gig Harbor	WA	N/A	N/A
Neogi; Amar N.	Seattle	WA	N/A	N/A

US-CL-CURRENT: 428/192; 297/219.1, 297/229, 297/DIG.5, 428/326, 428/340, 5/483, 5/484, 5/487, 604/367, 604/378, 604/379 , 604/381, 604/393

ABSTRACT:

Materials have at least one layer comprising a mixture of thermoplastic and other fibers. This latter layer may be thermobonded together and then densified along at least a section of the eventual peripheral edge margin of an article to be formed from the material. Thermoplastic material-containing cover sheets may also be secured to the core and densified in this manner. The entire eventual peripheral edge margin of the article is typically densified. The material is cut within the densified region or slightly outside the densified region to provide a soft peripheral edge. Absorbent materials may be thermobonded within the layer and surrounded by a densified edge to fix them within the article. The composite materials are used in manufacturing infant car seat liners and other articles. In addition, sections of the material may be densified and provided with weakened areas, such as perforations, to enable users to selectively separate the articles along the perforations.

80 Claims, 21 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 6

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

☐ 7. Document ID: US 4891454 A Relevance Rank: 91

L2: Entry 6 of 11 File: USPT Jan 2, 1990

US-PAT-NO: 4891454
DOCUMENT-IDENTIFIER: US 4891454 A

TITLE: Infant car seat liner

DATE-ISSUED: January 2, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Perdelwitz, Jr.; Lee E.	Tacoma	WA	N/A	N/A
Hanke; David E.	San Diego	CA	N/A	N/A

US-CL-CURRENT: 428/137; 297/219.12, 297/229, 297/DIG.5, 428/138, 428/156, 428/171, 428/172, 428/192, 428/218, 428/219, 428/323, 428/326, 428/903, 428/920, 5/483, 5/484, 5/487

ABSTRACT:

A disposable infant seat liner is described with shoulder strap receiving slotways and leg or crotch strap receiving slotways designed to fit infant seat liners having various strap placements. Infant carrier handle or strap receiving slotways may also be included, and may be of an arcuate shape, for receiving infant carrier handles or waist straps. The strap receiving slotways may be selectively opened by a user and may also be perforated to facilitate this selective opening.

25 Claims, 7 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 3

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

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8. Document ID: US 4892769 A   Relevance Rank: 91

L2: Entry 5 of 11   File: USPT   Jan 9, 1990

US-PAT-NO: 4892769
DOCUMENT-IDENTIFIER: US 4892769 A

TITLE: Fire resistant thermoplastic material containing absorbent article

DATE-ISSUED: January 9, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Perdelwitz, Jr.; Lee E.	Tacoma	N/A	N/A	WA
Gaddis; Paul G.	Renton	N/A	N/A	WA
Iff; Ron H.	Puyallup	N/A	N/A	WA
Cotie; Michael E.	Tacoma	N/A	N/A	WA
Neogi; Amar N.	Seattle	N/A	N/A	WA

US-CL-CURRENT: 428/68; 297/219.12, 297/229, 297/DIG.5, 428/192, 428/326, 428/76, 428/920, 5/413R, 5/417, 604/367, 604/378, 604/393

ABSTRACT:

Materials have at least one layer comprising a mixture of thermoplastic and other fibers. This latter layer may be thermobonded together and then densified along at least a section of the eventual peripheral edge margin of an article to be formed from the material. Thermoplastic material-containing cover sheets may also be secured to the core and densified in this manner. The entire eventual peripheral edge margin of the article is typically densified. Fire retardant materials may be thermobonded within the layer to fix them within the article. The densified edge also helps to fix these materials in place. The composite materials are used in manufacturing infant car seat liners and other articles. Fire retardant films may be included as cover sheets for these materials. These films are typically bonded at every point of contact to an underlying core.

32 Claims, 13 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 4

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

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☐ 9. Document ID: US 4900377 A   Relevance Rank: 91

L2: Entry 4 of 11   File: USPT   Feb 13, 1990

US-PAT-NO: 4900377
DOCUMENT-IDENTIFIER: US 4900377 A

TITLE: Method of making a limited life pad

DATE-ISSUED: February 13, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Redford; Douglas E.	Puyallup	WA	N/A	N/A
Perdelwitz, Jr.; Lee E.	Tacoma	WA	N/A	N/A
Iff; Ron H.	Puyallup	WA	N/A	N/A
Gaddis; Paul G.	Renton	WA	N/A	N/A
Halley; David G.	Renton	WA	N/A	N/A
Cotie; Michael E.	Tacoma	WA	N/A	N/A
Hanke; David E.	San Diego	CA	N/A	N/A
Neogi; Amar N.	Seattle	WA	N/A	N/A

US-CL-CURRENT: 156/62.2; 156/160, 156/209, 156/251, 156/267, 156/269, 162/146, 162/157.2

ABSTRACT:

Articles are formed of materials which have at least one layer comprising a mixture of thermoplastic and other fibers. This latter layer may be thermobonded together and then densified along at least a section of the eventual peripheral edge margin of an article to be formed from the material. Thermoplastic material containing cover sheets may also be secured to the core and densified in this manner. The entire eventual peripheral edge margin of the article is typically densified. The material is cut within the densified region or slightly outside the densified region to provide a soft peripheral edge. Absorbent materials may be thermobonded within the layer and surrounded by a densified edge to fix them within the article. The composite materials are used in manufacturing infant car seat liners and other articles. In addition, sections of the material may be densified and provided with weakened areas, such as perforations, to enable users to selectively separate the articles along the perforations.

42 Claims, 21 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 6

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

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☐ 10. Document ID: US 4961930 A   Relevance Rank: 91

L2: Entry 3 of 11   File: USPT   Oct 9, 1990

US-PAT-NO: 4961930
DOCUMENT-IDENTIFIER: US 4961930 A

TITLE: Pet pad of thermoplastic containing materials with insecticide

DATE-ISSUED: October 9, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Perdelwitz, Jr., Lee E.	Tacoma	WA	N/A	N/A
Young; Robert H.	Maple Valley	WA	N/A	N/A
Hasenwinkle; Earl D.	Puyallup	WA	N/A	N/A
Iff; Ron H.	Puyallup	WA	N/A	N/A
Neogi; Amar H.	Seattle	WA	N/A	N/A

US-CL-CURRENT: 424/411; 119/28.5, 119/677, 428/192, 428/402, 428/907, 428/913

ABSTRACT:

Pet pads contain insecticide and have at least one layer comprising a mixture of thermoplastic and other fibers. This latter layer may be thermobonded together and then densified along at least a section of the eventual peripheral edge margin of a pet pad to be formed from the material. By including insecticide in the mixture prior to thermobonding, the insecticide is fixed in the pad during thermobonding. Thermoplastic material-containing cover sheets may also be secured to the core and densified along the periphery of the pad. The entire eventual peripheral edge margin of the pet pad is typically densified. The densified edge acts as a partial liquid barrier and also helps retain the insecticide in the pad, especially if the insecticide is not fixed by thermobonding.

15 Claims, 8 Drawing figures Exemplary Claim Number: 4
Number of Drawing Sheets: 3

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

☑ 11. Document ID: US 5527429 A   Relevance Rank: 91

L2: Entry 1 of 11   File: USPT   Jun 18, 1996

US-PAT-NO: 5527429
DOCUMENT-IDENTIFIER: US 5527429 A

TITLE: Method of preparing paper for filter bags, apparatus for implementing the method, and product obtained thereby

DATE-ISSUED: June 18, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Dambreville; Abel	Rosporden	N/A	N/A	FRX
Le Fol; Roger	Quimper	N/A	N/A	FRX
Deleplanque; Philippe	Quimper	N/A	N/A	FRX
Le Brech; Yves	Scaer	N/A	N/A	FRX

US-CL-CURRENT: 162/129; 162/109, 162/157.1, 210/508, 428/158, 55/382, 55/528

ABSTRACT:

A method of preparing paper for filter bags, the method of the type comprising a step during which a non-woven paper is prepared comprising two superposed layers, namely a layer based on synthetic fibers and a layer of cellulose fibers, by a technique which is known per se, wherein the method includes a subsequent step of subjecting the non-woven paper to a calendering operation between a support structure and a heated cylinder having projections. The present invention also provides apparatus for implementing the method and products obtained in this manner.

9 Claims, 6 Drawing figures Exemplary Claim Number: 1
Number of Drawing Sheets: 1

Full | Title | Citation | Front | Review | Classification | Date | Reference   KWIC | Draw Desc | Image

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DWPI	jute or kraft orabaca or hemp or kenaf or wood	95108	L10
DWPI	l5 and l6	0	L9
USPT	l4 and l7	0	L8
USPT	(non-heat or nonheat or no heat) and seal	2315	L7
DWPI	(non-heat or nonheat or no heat) and seal	128	L6
DWPI	fibrous and (nonwoven or unwoven or non-woven) and porous web	8	L5
USPT	fibrous and (nonwoven or unwoven or non-woven) and porous web	189	L4
DWPI	fibrous and (nonwoven or unwoven or non-woven) and (non-heat or nonheat or noheat) and seal and porous web	0	L3
USPT	fibrous and (nonwoven or unwoven or non-woven) and (non-heat or nonheat or noheat) and seal and porous web	0	L2
USPT	fibrous and (nonwoven or unwoven or non-woven) non heat seal and porous web	0	L1

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27. A method as claimed in claim 26 wherein the pattern is formed whilst the paper is on the wire by means of a patterning station which is comprised of a rotary hollow cylinder having perforations defining the required pattern in the wall thereof and means for directing a fluid radially outwardly through the perforations in the cylinder to form the pattern in the web.

28. A method as claimed in claim 26 wherein title fluid is liquid.

29. A method as claimed in claim 28 wherein the liquid pressure is 100 to 800 kPa (1 to 8 bars).

30. A method as claimed in claim 29 wherein the liquid pressure is 300 to 400 kPa (3 to 4 bars).

31. A method of producing a patterned paper of **non-heat seal** tissue comprising wet laying a first fibrous layer and subsequently a second layer thereon, and forming a pattern in the wet laid web during the paper forming step whilst the web is on the papermaking fabric or wire by means of fluid by means of fluid jets.

32. A method as claimed in claim 31 wherein water is withdrawn from the first layer prior to laying the second layer.

33. A method as claimed in claim 31 in which the first layer comprises vegetable fibres and the second layer comprises hardwood fibres.

INCL INCLM: 426/077.000
INCLS: 426/079.000; 426/084.000; 428/316.600; 162/091.000; 162/098.000; 162/141.000; 162/213.000
NCL NCLM: 426/077.000
NCLS: 162/091.000; 162/098.000; 162/141.000; 162/213.000; 426/079.000; 426/084.000; 428/316.600
IC [7]
ICM: B65B029-02
ICS: B32B007-02; D21H027-38
EXF 426/77; 426/79; 426/84; 428/316.6; 162/91; 162/98; 162/141; 162/213
ARTU 171

=> d 2 all

L3 ANSWER 2 OF 2 USPATFULL
AN 81:50283 USPATFULL
TI Heat seal fibrous web and method of its manufacture
IN Elston, Colin, Windsor, CT, United States
Hoffman, Herbert A., Longmeadow, MA, United States
Murphy, H. Joseph, Longmeadow, MA, United States
PA The Dexter Corporation, Windsor Locks, CT, United States (U.S. corporation)
PI US 4289580 19810915
AI US 1979-93441 19791113 (6)
DT Utility
FS Granted

REP	US 995602	Sep 1909	162/115.000	Howes
	US 2414833	Jan 1947	162/129.000	Osborne
	US 3067087	Dec 1962	162/157.000R	Gorski et al.
	US 3350260	Oct 1967	162/116.000	Johnson

EXNAM Primary Examiner: Chin, Peter
LREP Prutzman, Kalb, Chilton & Alix
CLMN Number of Claims: 17
ECL Exemplary Claim: 1

DRWN 3 Drawing Figure(s); 1 Drawing Page(s)

AB Improved infusion web material for **tea bags** and the like is provided by using synthetic pulp in the heat seal phase and forming therein an array of a large number of small discrete craters. These craters, which exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters, are formed prior to drying the initially formed multi-phase material by directing a low impact mist-like liquid spray onto the heat seal phase. The droplets from the spray displace the fibers to form the shallow craters and, at times, expose portions of the underlying **non-heat seal** fiber phase. The small craters are present throughout the heat seal phase at a concentration of at least about 40 per square centimeter and occupy about 10-75 percent of the total exposed surface area of the heat seal fiber phase of the material. The web also is treated with a surfactant.

SUMM TECHNICAL FIELD

The present invention relates generally to water laid infusion web materials and more particularly is concerned with a new and improved multi-phase heat sealable fibrous web having particular application as infusion packaging material, such as for **tea bags** and the like. The invention also relates to the process of manufacturing such fibrous web materials.

BACKGROUND ART

Heretofore, heat sealable **tea bag** papers have comprised both single phase and multi-phase sheet material. Both materials have included **non-heat seal** fibers such as cellulosic fibers in combination with heat seal fibers. The particular heat seal fibers used have included thermoplastic fibers, such as the fibers of a copolymer of polyvinyl acetate, commonly referred to as "vinyon," and polyolefin fibers such as fibers of polyethylene and polypropylene. These synthetic heat seal fibers are typically smooth rod-like fibrous materials exhibiting a low specific surface area. They form a highly porous and open structural arrangement which, despite their hydrophobic character, permit adequate liquid permeability and transmission of both hot water and **tea** liquor through the sheet material during the normal brewing process. During manufacture the sheet material is dried by a conventional heat treatment resulting in a slight contraction of the heat seal thermoplastic fibers that maintains and enhances the desired open distribution of the heat seal particles throughout the sealing phase of the web.

In recent years, fibrillar materials formed from polyolefins and similar polymers have been introduced in the paper industry. These materials, commonly referred to as "synthetic pulps", exhibit certain processing advantages over the smooth rod-like synthetic fibers used heretofore. The synthetic pulps exhibit a fibrilliform morphology and resultant higher specific surface area. Additionally, they are more readily dispersible in water without the need for additional surface active agents and, although hydrophobic in nature, they do not dewater as rapidly as conventional synthetic fibers and therefore avoid plugging problems in lines, pumps, etc., within the paper-making machine. Further, these synthetic particles do not exhibit the tendency to "float out" in chests and holding tanks used in the typical paper-making process. For these reasons the synthetic pulps exhibit a potential for use as the heat seal component of infusion package materials, particularly since they provide substantially improved wet seal strength under end use conditions, that is, improved wet seal strength in a hot aqueous liquid environment and improved resistance to seal delamination under boiling and steaming test conditions.

Despite the apparent advantages evident in the use of synthetic pulp for heat seal infusion paper application, it has been found that such material exhibits a significant disadvantage with respect to its infusion properties and its wettability. This disadvantage relates directly to its usefulness in the paper-making process, that it, its fibrilliform structure and high specific surface area. When the synthetic pulp is heat treated, as in the conventional drying operation, it tends to soften and flow, typically forming a film, albeit discontinuous, particularly in the heat seal phase of a multi-phase sheet material. Unlike the highly porous and open web structure formed by the larger and smoother synthetic fibers, the high surface area pulp with its lower density, smaller particle size and more numerous particles results in a closed, low permeability structure. In addition, the hydrophobic nature of the basic polymer inhibits water permeability and any surfactant added to the synthetic pulp is neutralized during the drying process. The result is that certain areas of the web surface are rendered water impermeable substantially retarding or inhibiting infusion and reducing the water permeability and wettability of the material. In use, the non-wetted or partially wetted areas of the web material are easily observed as opaque areas on the sheet while the thoroughly wetted areas exhibit a transparent appearance. The reduced wettability of the web material coupled with its mottled opaque appearance influences the aesthetic attractiveness of the product under end use conditions and, therefore, its acceptability by the consumer.

DISCLOSURE OF INVENTION

Accordingly, the present invention provides a new and improved heat seal fibrous web material utilizing synthetic pulp as the heat seal fibrous component yet at the same time obviates the infusion and wettability deficiencies noted hereinbefore with respect to the use of such material. More specifically there is provided a heat sealable fibrous web having a disruptively modified heat seal phase having a larger total infusion area with an attendant enhancement in liquid permeability.

Additionally the present invention provides a new and improved process for the manufacture of heat seal infusion web materials having excellent infusion characteristics and improved strength characteristics through the utilization of synthetic pulp and the incorporation within the process of a technique for overcoming the infusion and wettability deficiencies observed heretofore with respect to the use of synthetic pulp material. This process involves the modification of essentially only the heat seal phase of a multiphase heat seal infusion web material to facilitate improved infusion characteristics despite the greater covering power of the high surface area hydrophobic synthetic pulp material. This is accomplished by disruptively modifying the heat seal material's heat generated film, thereby increasing the open surface area of the heat seal phase to provide a larger total infusion area and greater water permeability. This process includes the step of forming a random array of small high-infusion areas having a reduced synthetic pulp content, with some areas being essentially free of heat seal synthetic fibers so as to fully expose the underlying **non-heat seal** phase of the multi-phase material. These small high-infusion areas can be formed in a simple and facile manner at relatively low cost with no substantial decrease in the production rate of the multi-phase heat seal material yet with improved seal strength under end use conditions by a simple low impact mist-like spray and subsequent treatment with a surfactant.

The heat seal phase of a multi-phase infusion web material is provided with a random array of a large number of small discrete craters by displacement of particles in the heat seal phase to form the craters.

These craters, which expose portions of the underlying **non-heat seal** fiber phase, exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters and are formed prior to drying the initially formed multi-phase web material. The small craters are present throughout the heat seal phase at a concentration of at least about 40 per square centimeter and occupy about 10-75 percent of the total exposed surface area of the heat seal fiber phase of the material.

DRWD BRIEF DESCRIPTION OF DRAWINGS

A better understanding of the invention will be obtained from the following detail description of the several steps of the process together with the relation of one or more of such steps with respect to each of the others and the article processing the features, properties and relation of elements exemplified in the following detailed description. In the drawing:

FIG. 1 is a schematic view of the wet end of a paper-making machine depicting one way of operating the process of the present invention for producing a multi-phase infusion web material;

FIG. 2 is an illustration of a planar view of the fibrous web material of the present invention depicting the craters formed within the heat seal phase, the view being substantially enlarged for purposes of illustration, and

FIG. 3 is a further enlarged sectional view of the web material of FIG. 2 taken along the line 3--3 of FIG. 2.

DETD BEST MODE FOR CARRYING OUT THE INVENTION

As mentioned hereinbefore, the present invention provides a technique for improving the infusion characteristics of a heat seal fibrous web material suited for use in **tea bags** or the like.
This is accomplished by, in effect, enhancing the water permeable surface area of the heat seal phase of that material. In the preferred embodiment the enhancement is achieved primarily by physical disruption of the heat seal phase and secondarily through chemical treatment of the fibrous web material. It is this combination of physical and chemical treatments which provides the enhanced infusion characteristics found necessary when using larger surface area heat seal particles of low density and smaller particle size, such as the fibrous particles in commercially available synthetic pulp.

As mentioned, the invention is primarily concerned with multi-phase sheet material since it is directed toward the disruption of only one phase of the multi-phase material, namely, the heat seal phase. Additionally, the invention is primarily concerned with multi-phase water laid material produced in accordance with the conventional paper-making techniques. In this connection numerous different techniques have been employed herefore to make the multi-phase fibrous webs. Typical of those found most useful in the production of infusion web materials is the dual headbox technique described in U.S. Pat. No. 2,414,833. In accordance with that process and as illustrated in FIG. 1, a suspension of **non-heat seal** fibers 10 flow through a primary headbox 12 and continuously deposit as a base phase on an inclined wire screen 14. The heat seal material 16 is introduced into the primary headbox at a location immediately after or at the point of deposition of the **non-heat seal** fibers on the inclined wire. This may be carried out by means of an inclined trough 18, as shown, or by a secondary headbox in

such a manner that the heat seal particles comingle slightly with the **non-heat seal** paper-making fibers flowing through the primary headbox 12. In this way, the non-thermoplastic fibers 10 have a chance to provide a base mat or **non-heat seal** phase, 20, best shown in FIG. 3, prior to the deposition of the heat seal phase, 22. As is appreciated the latter is secured to the base phase by an interface formed by the intermingling of the particles within the aqueous suspensions. Typically, sheets produced in this manner have **non-heat seal** fibrous covering the entire surface area of the sheet material on the surface in contact with the inclined fiber collecting screen 14 while the top of the sheet material has some **non-heat seal** fibers and some heat seal fibers with the latter greatly predominating. In this way there is not a clear line of demarcation between the two phases of the multi-phase sheet material; yet there is a predominance of heat seal thermoplastic material on the top surface or top phase 22 of the multi-phase sheet. The center or interface boundary, of course, is composed of a mixture of the two different types of fibers.

Although the technique or process described in the aforementioned U.S. Pat. No. 2,414,833 is preferably followed, the heat seal material used in preparing the heat seal phase of the sheet material is different. It is comprised of synthetic pulp fibrid-like particles. In view of the improved characteristics of such materials, including their high specific surface area, water insensitivity, low density, and smaller particle size, substantially improved seal strength characteristics under end use conditions can be achieved. These synthetic pulps are typically synthetic thermoplastic materials, such as polyolefins, having a structure more closely resembling wood pulp than synthetic fibers. That is, they contain a micro-fibrillar structure comprised of micro-fibrils exhibiting a high surface area as contrasted with the smooth, rod-like fibers of conventional synthetic man-made organic fibers. The synthetic thermoplastic pulp-like material can be dispersed to achieve excellent random distribution throughout the aqueous dispersing media in a paper-making operation and, consequently, can achieve excellent random distribution within the resultant sheet product. The pulps found particularly advantageous in the manufacture of infusion sheet materials are those made of the high density polyolefins of high molecular weight and low melt index.

The fibrils can be formed under high shear conditions in an apparatus such as a disc refiner or can be formed directly from their monomeric materials. Patents of interest with respect to the formation of fibrils are the following: U.S. Pat. Nos. 3,997,648, 4,007,247 and 4,010,229. As a result of these processes, the resultant dispersions are comprised of fiber-like particles having a typical size and shape comparable to the size and shape of natural cellulosic fibers and are commonly referred to as "synthetic pulp". The particles exhibit an irregular surface configuration, have a surface area in excess of one square meter per gram, and may have surface areas of even 100 square meters per gram. The fiber-like particles exhibit a morphology or structure that comprises fibrils which in turn are made up of micro-fibrils, all mechanically inter-entangled in random bundles generally having a width in the range of 1 to 20 microns. In general, the pulp-like fibers of polyolefins such as polyethylene, polypropylene, and mixtures thereof have a fiber length well suited to the paper-making technique, e.g., in the range of 0.4 to 2.5 millimeters with an overall average length of about 1 to 1.5 millimeters. Typical examples of these materials are the polyolefins sold by Crown Zellerbach Corporation under the designation "FYBREL", by Solvay and Cie/Hercules under the designation "LEXTAR" and by Montedison, S.P.A. and others.

Since the pure polyolefin particles are hydrophobic and have a surface tension that does not permit water wettability, the material obtained commercially is frequently treated to improve both wettability and dispersibility in aqueous suspensions. The amount of wetting agent added, however, is relatively small, and generally is less than 5 percent by weight, e.g., about 3 percent by weight and less. The chemically inert polyolefins are thermoplastic materials that become soft with increasing temperature; yet exhibit a true melting point due to their crystalinity. Thus, synthetic pulps of polyethylene exhibit a melting point in the range of 135.degree. C. to 150.degree. C. depending on the composition and surface treatment of the material.

Typically, the fiber composition of the heat seal phase is such that it contains cellulosic paper-making fibers in addition to the heat seal fibers. In this connection, it has been found that for optimum results it is preferred that the heat seal component constitute approximately 70 to 75 percent of the fiber composition within the heat seal fiber slurry. As will be appreciated, variations in the amount of heat seal material will depend on the specific material utilized as well as the source of that material. However a sufficient amount of heat seal particles must be employed to provide satisfactory heat seal conditions in the end product. Consequently, it is preferred that about 60 to 80 percent of the fibers in the heat seal fiber suspension be of a thermoplastic heat seal type in order to provide the necessary characteristics.

It should be noted that the preferred heat seal polymers are those which have already received approval for use in food and beverage applications. Consequently, the synthetic pulp made from polyolefins and vinyon are the preferred materials while other materials may be used for different end use applications. As will be appreciated, the remaining fibers may be of a wide variety depending upon the end use of the fibrous web material. However, for infusion packages having application in the food and beverage field, it is preferable to employ approved natural or man-made fibers and preferably cellulosic natural fibers, for example, fibers of bleached or unbleached kraft, manila hemp or jute, abaca and other wood fibers. A variety of infuser web materials may be made from these fibers and utilized in accordance with the present invention. However, for ease of understanding and clarity of description, the invention is being described in its application to porous infusion web materials for use in the manufacture of **tea bags** and the like.

As mentioned, the present invention involves opening or enhancing the water permeability of the heat seal phase of a multi-phase sheet material. This can be achieved by altering, disrupting or displacing the heat seal fibers within the heat seal phase prior to the conventional heat drying operation. Although this can be accomplished in numerous different ways, such as by the entrapment and melting of ice particles, or by the use of decomposable particles, air bubbles and the like, it is preferred in accordance with the present invention to achieve the disruptive relocation within the heat seal phase by the use of a light water spray or mist directed onto the heat seal phase, preferably as the initially formed fibrous web material leaves the headbox of a paper-making machine. As is known to those skilled in the paper-making art, the fibrous web material leaving the headbox consists predominantly of dispersing medium with the fibers constituting only a minor portion, that is, less than 20 percent by weight, and typically less than 15 percent of the web material at this stage in its formation. In other words, the fiber consistency has changed from a level of about 0.01-0.05 percent by weight within the headbox to a fiber consistency of about from 1 to 2 percent by weight to 8 to 12 percent by weight on the web forming wire. At this stage, the newly formed fibrous web material is

highly succeptible to fiber re-arrangement without adversely affecting the fiber to fiber bonding within the resultant fibrous product. Accordingly, by directing low impact mist-like spray droplets onto the sheet material immediately after it is formed the mist droplets act as if they are falling into a viscous liquid and do not penetrate deeply into the web, disrupting only the heat seal layer and leaving undisturbed the fibers of the base web material.

Preferably, the spray head generating the mist, such as a spray nozzle 30 is located adjacent the lip of the heat seal tray or headbox and the spray is angled slightly away from the vertical toward the wire 14 so that any large water droplets falling from the nozzle will fall harmlessly into the undeposited fiber dispersion within the headbox rather than on the partially dewatered fibrous web material. By positioning the mist spray head at this location, the mist water droplets impact on the partially dewatered fibrous web material between its final formation point upon emergence from the headbox and the suction slot 32 of the paper-making machine where the formed but partially dewatered fibrous web material is subject to a vacuum designed to significantly reduce the water content of the web and facilitate removal of the web from the web forming wire.

Since large water droplets will have the effect of not only removing the heat seal fibers but also a substantial portion of the base phase thereby causing an unsightly disruption in the web, it is preferred that the spray nozzle be selected and that the water pressure be controlled so as to produce a large array of small droplets. The spray can by synchronized with the speed of the paper-making machine so that the very small water drops of a mist consistency having a low impact will impinge on the web at a controlled rate. By suitable choice of the nozzle, the impact force of the water droplets are controlled to produce a disruptive effect on the fibrous web material which affects only the upper portion or heat seal phase of the fibrous web material, leaving the lower or support phase substantially unaffected.

In the preferred embodiment, it has been found that a low impact spray nozzle provides the desired mist-like spray conditions. The low impact type of spray helps to avoid disturbing the base web fibers of the multi-phase sheet material. Multiple spray heads are preferably used and are spaced transversely across the headbox of the paper-making machine. High performance, low output, finely atomizing spray heads operate effectively with minimum water pressure such as mill supply water at 40-45 psi, to provide the preferred spray design such that the mist-like atomized spray impinges on the newly formed web material. In a typical arrangement the nozzles are located approximately six inches apart across the width of the headbox and are spaced from the web forming wide by a distance of about eighteen inches.

A spray head that has been found particularly effective is the hollow cone type designated "MB-1" and sold by Buffalo Forge Company of New York. When operated at a low water pressure of about 40 psi, the 1/8 inch orifice diameter nozzle provides a spray cone angle of about 45 to 50 degrees and a throughput in the range of approximately 0.2-1.0 liter per minute of water through each spray head. Due to the low water pressure conditions and the highly atomized droplets formed by the hollow cone spray head, the resultant water droplets impinging on the heat seal layer of the newly formed heat seal phase are of a fine or minute droplet size. The actual size of the droplets are difficult to measure but based on the sizes of the craters formed by the drops it is believed they generally fall within the range of about 50-5000 microns in diameter, with the preferred droplet size being approximately 200-2000 microns.

Due to the high water content of the fibrous web material prior to reaching the suction box 32, the water droplets will tend to displace the fibers, pushing them to the outer edge of the drop and forming small shallow craters in the sheet material, as shown at 34 in FIGS. 2 and 3. The dislodged and displaced fibers within the heat seal phase are pushed to the periphery of the craters by the droplets, as shown at 36 of FIG. 3, leaving an area substantially free of heat seal fibers within the central portion 38 of each crater. Although this results in a sheet material initially having a mottled effect, the small size of the craters i.e., 0.2-2 mm, and the subsequent heat drying operation avoid any unsightly appearance in the resultant web material. In this connection, heat seal **tea bag** paper is conventionally given a heat treatment during its manufacture to dry and partially adhere the heat sealable fibers within the upper phase to the base web fibers in order to provide the desired integrated web structure. During this heat treatment, synthetic pulp fibers become transparent and the slightly mottled effect resulting from the mist spray becomes almost entirely unobservable. However, if the mist spray is of such a force and size so as to also disrupt the base fiber layer, then the disruption thus produced will be discernable even after the heat drying of the synthetic pulp fibers within the heat seal phase.

As will be appreciated, the craters formed by the water droplets will be present in a random array on the surface of the heat seal material. The size and concentration of the craters will vary substantially depending on the type of spray head and the impact force with which the water droplets strike the web material. Generally, it is preferred that the water droplets create a sufficiently large number of small discrete craters so that the craters occupy up to but less than about 75 percent of the total exposed surface area of the material. In this connection, it is important to assure that a sufficient distribution of heat seal fibers remains so as to provide the necessary heat sealing function. Typically, the craters are present throughout the entire planar extent of the heat seal phase at a concentration of at least about 40 per square centimeter of surface area, and occupy a minimum of about 10 percent of the total exposed surface area of the heat seal phase. An average crater density or concentration is about 60 to 80 craters per square centimeter occupying about 40-55 percent of the total exposed surface area. The craters formed by the impact of the spray drops have a shallow depth and, as indicated, a relatively random pattern that may vary depending on the particular shower head used to form the mist-like spray. Consequently, two adjacent craters may partially overlap as illustrated at 40 in FIG. 2. Additionally, the linear speed of the web forming wire will have an effect on the shape of the crater although the primary effect of machine speed is on the concentration and number of craters per unit of area of the sheet material. In this connection a web formed at 75 fpm linear speed will be impacted by about 7-30 ml of spray per square foot of web to provide the desired crater concentration.

The craters will vary in size and in configuration although most will be circular and typical of the configuration formed as a result of the spray droplets impinging on the readily displacable fibers in the heat seal phase of the sheet material. Typically, the craters will exhibit an average planar area of at least about 1.times.10.sup.-3 square centimeters while the individual craters will vary in surface area from about 3.times.10.sup.-1 to 3.times.10.sup.-4 square centimeters. Although the small size of the craters prevents accurate measurements, the craters naturally vary in size with the size of the droplets. Typically the average planar area of each crater falls within the range of 1 to 9.times.10.sup.-3 square centimeters. The diameter of the resultant craters typically falls within the range of 0.04 to 0.2 centimeters, with the average crater diameter being about 0.07 centimeters.

Not only may the production rate alter the size, concentration, and population of the resultant craters, but also the particular shower head can permit substantial variation in the size and pattern of the water droplets used to form the craters since those nozzles can be fitted with interchangeable shower discs. As indicated, however, the primary object of the spray is not simply to create a crater-like impression in the web, but rather to displace some of the fibers in the heat seal phase to provide an area of improved receptivity to water permeability and therefore improved infusion characteristics.

As mentioned hereinbefore, the water permeability of the heat seal web can be enhanced further by the utilization of chemical treatments. In particular, it has been found that the heat seal hydrophobic layer can be treated with surface active agents or surfactant systems to improve the wettability and water permeability of the heat seal phase, even after that phase has been opened by the crater forming technique described hereinbefore. The treatment with the chemical surfactant is not such as to produce a chemical reaction but rather is more in the nature of an alteration in the surface characteristics of the fibrous web material, particularly the wetting characteristics. It is believed that the surface active agent or surfactant will affect the surface tension so as to alter the contact angle between the infusing liquids and the synthetic pulp particles. The contact angle is the angle between a surface and the tangent to a drop of water which has been applied to the surface at its point of contact with the surface. The theory of contact angles and their measurements are well known to those skilled in the art.

The surface active agents can be conveniently classified as anionic, cationic, nonionic and amphoteric. The materials are characterized structurally by an elongated non-polar portion having little affinity for water or water soluble systems and a short polar portion possessing high affinity for water and water soluble systems. The polar portion is hydrophilic and the non-polar portion is lipophilic (hydrophobic). Although different surfactants may be used for different applications, it has been found that nonionic materials having an appropriate hydrophile/lipophile balance (HLB) are preferred for food and beverage uses such as **tea bag** and similar infusion materials.
The most consistent feature of the effective surfactants is that they are nonionic, usually containing a polyoxyethylene group. The nonionic surface active agents do not dissociate in water but nevertheless are characterized by a relatively polar portion and non-polar portion and are the only class of surfactants that can be assigned an HLB number. Materials having HLB numbers from about 10 to 28 appear to work well. However, even among otherwise acceptable surfactants it is necessary that the material meet FDA approval and be free of adverse taste effects. Many surfactants give a strong mouth feel and leave a foamy, plastic or bitter aftertaste. As mentioned, the preferred surfactants are those that contain polyoxyethylene groups and among these, materials such as the polyoxyethylene (20) sorbitan monostearate (HLB-14.9) sold under the trademark "Tween-60" by ICI America have given best results particularly in the taste test. Blends of two or more agents also may be used.

Typically, the surfactant is added to the sheet material after formation and conveniently can be applied as a dilute solution (1 percent) of the agent. Such an operation will generally result in the addition of 0.1-0.6 percent of the surface active agent based on the dry fiber weight with 0.3 percent being preferred. It may be applied at various stages in the paper-making process, even while it is still on the forming wire, or later by size press or at the wind up reels. Application at the wet end can result in very poor retention of the

agent and/or lowering of the internal bonding strength or tensile properties of the finished paper so that, preferably, the material is applied to the formed and dried web. This can be achieved by spraying or size pressing the web with a large amount of the solution containing a low concentration of surface active agent followed by subsequent drying. This leads to a uniform distribution of the surface active agent through the web. Of course other well known alternative methods of applying the material prior to the take up reel using a small amount of high concentration solution or by calendar stack application may be used. The preferred method is to spray the dry sheet material with a one percent solution of the surface active agent between two drying sections of the paper-making machine using a very coarse spray to obtain high absorption efficiency. The surface active agent employed to produce the desired effect is limited not only to those which have FDA approval for the particular end use and have minimal effect on taste, but also to those that will show maximum effect at a minimum application level.

As mentioned, it has been found that the use of synthetic pulps, while providing improved seal strength characteristics, are deficient with respect to wettability and infusion properties. The expression "wettability" refers to the speed and uniformity of water abdsorption by the paper under end use conditions. Thus upon immersion of the material non-wetted or poorly wetted areas of the sheet are easily observed as opaque white areas while the thoroughly wetted areas immediately become transparent. A poorly wettable paper, therefore, produces an aesthetically displeasing appearance and can be readily noted while a paper exhibiting good wettability characteristics will rapidly absorb water and exhibit a uniform appearance. "Infusion" refers to the rate at which water can pass into the **tea bag** and **tea** liquor can pass out of the **tea bag** as well as the degree of extraction which is able to take place within a specified time. This is usually reported in terms of "first color" and "percent transmittance", respectively. When testing for first color a **tea bag** made from the material to be tested is carefully placed in quiet distilled water after the water has been brought to a boil. Using a stopwatch the time is recorded at which the first amber stream appears at the bottom of the sample. A first color time of about 5-6 seconds is considered indicative of good infusion characteristics. The percent transmittance test is conducted by measuring the transmittance of the brew after a 60 second steep time using a Markson Colorimeter Model T-600 at a wavelength of 530 m.mu. and using a 1 cm. cell. A target value for good infusion is in the mid-sixty percentile range with transmittance decreasing as infusion improves.

The following samples are given in order that the effectiveness of the present invention may be more fully understood. These examples are set forth for the purpose of illustration only and are not intended in any way to limit the practice of the invention. All parts are given by weight.

EXAMPLE I

This example shows the improved infusion characteristics obtained by using the process of the present invention.

A base phase fiber dispersion was prepared from about 75 percent hemp fibers and 25 percent wood fibers and a separate heat seal fiber dispersion was prepared using a fiber formulation comprising 75 percent polyethylene synthetic pulp FYBREL.RTM. E-400 and 25 percent kraft wood pulp. Using these dispersions a two phase heat seal sheet material was formed on a paper-making machine operated at a linear speed of about 75 feet per minute to provide a web material having a basis weight of about 16.5 grams per square meter. As the sheet emerged from the headbox, it

was treated with a fine mist water spray directed toward the wet fibrous web at a location of about 1 inch from the stock dam. The spray nozzle was of the hollow cone type, Model MB-1 with a 1/8 inch orifice located about 18 inches from the web at a pressure of about 40 psi. The sheet material thus produced was dried on steam heated can dryers and was subject to an airless spray of a 0.16 percent solution of polyoxyethylene (20) sorbitan monostearate surfactant (Tween-60). The resultant material was designated Sample 1-A.

For comparison purposes, a second web material was produced in the identical manner as Sample 1-A from the same fiber dispersions except that the web was not subject to the mist spray and did not receive the surfactant treatment. The second material was designated 1-B.

These web materials were tested for infusion characteristics and wettability and the results were compared with the properties of a commercial grade of heat seal **tea bag** paper designated Sample 1-C. The results are reported in Table 1. The first color and percent transmittance data is the average of four separate tests conducted in the manner set forth hereinbefore.

TABLE I

Sample No.	First Color (sec)	Transmittance (%)	Wettability
1-A	6.0	67.3	good
1-B	7.8	73.0	poor
1-C (control)	5.8	65.8	good

EXAMPLE II

The procedure of Example I was repeated except that a change was made in the type of synthetic pulp used in the heat seal layer. The FYBREL.RTM. was replaced by a synthetic pulp called "Pulpex" sold by Solvay and Cie. Sample 2-A is the material treated with the mist spray and surfactant while Sample 2-B is the identical material without the mist or surfactant treatments. Once again, the average of four tests are reported in the table.

TABLE II

Sample No.	First Color (sec)	Transmittance (%)	Wettability
2-A	8.0	70.3	good
2-B	9.0	77.8	poor

As can be seen the treatment according to the present invention provided substantial improvement in the infusion and wettability properties.

EXAMPLE III

This example illustrates the effect of the mist spray treatment on the infusion characteristics of a two phase heat seal material with and without the surfactant treatment.

In this example, the procedure of Example 1 was repeated. Sample 3-A was

treated by both the mist spray and surfactant while Sample 3-B is identical except that the surfactant treatment was omitted. Sample 3-C was prepared from the same fiber furnish but received no mist spray and no surfactant. Sample 3-D is a control sheet of a typical commercial two phase heat seal web material.

TABLE III

Sample No.	First Color (sec)	Transmittance (%)	Wettability
3-A	5.8	65.0	good
3-B	5.5	66.7	poor
3-C	7.5	69.2	poor
3-D (control)	5.5	64.7	good

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

CLM What is claimed is:

1. In a wet papermaking process for preparing a light weight multiphase heatsealable fibrous web material having excellent infusion characteristics comprising the steps of forming a dilute dispersion of heatsealable fibers in an aqueous dispersing medium; providing a fibrous substrate phase of non-heatsealing character; depositing said dispersion on said substrate phase while simultaneously removing a sufficient portion of said dispersing medium to form a partially dewatered heatsealable fiber phase superimposed on said substrate phase, said partially dewatered heatsealable phase having a fiber consistency of at least about one percent by weight with the remainder being substantially dispersing medium; and subsequently drying the resultant multi-phase web material to remove the dispersing medium and firmly secure the superimposed heatsealable phase to said substrate phase, the improvement wherein the heatsealable fibers are highly fibrillated synthetic thermoplastic particles and the process includes the step of disruptively dislodging and displacing portions of the heatseal particle in the partially dewatered heatseal fiber phase while superimposed on the fibrous substrate and prior to removing a major portion of the dispersing medium initially retained within said superimposed phase to provide a random array of discrete areas of reduced heatseal particle content and enhanced infusion in said multi-phase web material, the enhanced infusion areas being present throughout said heatseal phase at a concentration sufficient to occupy about 10-75 percent of the planar surface area of said heatseal fiber phase having an average diameter per area of up to 5 mm and an average planar area of at least 1.times.10.sup.-3 cm.sup.2 and being substantially invisible in the dried web material, said substrate phase being substantially unaffected by the displacement of portions of the heatseal phase and being itself substantially unmodified.

2. The process of claim 1 wherein said infusion areas of reduced heatseal particle content have an average concentration of at least about 40 per sq. cm.

3. The process of claim 1 wherein the step of dislodging and displacing the heatseal phase includes treating the partially dewatered phase with a low impact mist-like liquid spray to form a random array of a large number of small high infusion areas of reduced thermoplastic particle

content in the form of discrete shallow craters.

4. The process of claim 3 wherein the low impact liquid spray to dislodge and displace the heatseal particles and form the random array of a large number of small, high infusion areas of reduced heatseal particle content in the form of discrete shallow craters having an average planar area per crater of about 3.times.10.sup.-4 to 3.times.10.sup.-1 sq. cm. and an average diameter in the range of 0.05-5 mm., the process including the step of treating the heatseal phase with a surfactant.

5. The process of claim 4 wherein the finely atomized spray is formed using a high performance hollow cone type spray head and the craters occupy about 40-55 percent of the total surface area of the heatseal phase and have an average diameter of about 0.7 mm.

6. The process of claim 1 wherein the thermoplastic particles are a synthetic pulp comprised of high density polyolefin having a molecular weight greater than 40,000 and a melt index less than 0.1, the particles being of high specific surface area, low density and small particle size; the discrete areas being shallow craters having an average planar diameter in the range of 0.2-2 mm. and an average concentration of at least about 40 per sq. cm.

7. The process of claim 6 wherein the average concentration of craters is about 60-80 per sq. cm.

8. In a lightweight fibrous multi-phase heatsealable infusion web material comprising a non-heatseal fiber phase, a coextensive heatseal fiber phase superimposed thereon and an interface of intermixed non-heatseal and heatseal fibers secured between said phases, the improvement wherein said heatseal fiber phase and interface is provided with a large number of small, discrete physically modified high infusion areas of substantially reduced heatseal fiber content in the form of shallow craters that are substantially invisible in the dry web material, said high infusion areas occupying about 10-75 percent of the surface area of said heat-seal fiber phase having an average diameter per area up to 5 mm and an average planar area of at least 1.times.10.sup.-3 cm.sup.2, said underlying nonheatseal fiber phase being substantially free of associated areas of reduced fiber content.

9. The web material of claim 8 wherein the discrete shallow craters have an average planar area per crater in the range of about 3.times.10.sup.-4 to 3.times.10.sup.-1 sq. cm. and an average concentration of at least about 40 per sq. cm.

10. The web material of claim 8 wherein the heatseal fibers comprise synthetic pulp and the small shallow craters have an average diameter in the range of 0.05-5 mm.

11. The web material of claim 10 wherein the periphery of each crater has a higher synthetic pulp content than the non-crated planar portions of the heatseal phase, some of said craters being essentially free of heatseal fibers at their base so as to expose portions of said underlying nonheatseal phase.

12. The web material of claim 8 wherein the discrete shallow craters occupy 40-55 percent of the total surface area, the craters having an average planar area per crater in the range of about 1.times.10.sup.-3 to 9.times.10.sup.-3 sq. cm. at an average concentration of at least about 40 per sq. cm., said craters having an average diameter in the range of 0.2-2 mm.

13. The web material of claim 8 wherein the heatseal fibers comprise fibrillated thermoplastic synthetic pulp of high specific surface area and low density.

14. The web material of claim 13 wherein the synthetic pulp is comprises of high density polyolefin having a molecular weight greater than 40,000 and a melt index less than 0.1.

15. The web material of claim 8 containing a sufficient amount of surfactant to provide substantially uniform wettability within the heatseal phase of the web material.

16. The web material of claim 8 containing at least about 0.1 percent by weight of a nonionic surfactant containing a polyoxyethylene group, said surfactant being FDA approved for food contact applications, having a minimal effect on taste and providing substantially uniform wettability of the dried web material.

17. The web material of claim 16 wherein the surfactant is polyoxyethylene (20) sorbitan monostearate.

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INCL    INCLM: 162/109.000
        INCLS: 162/115.000; 162/129.000; 162/146.000; 162/208.000
NCL     NCLM:  162/109.000
        NCLS:  162/115.000; 162/129.000; 162/146.000; 162/208.000
IC      [3]
        ICM: D21H005-02
EXF     162/115; 162/116; 162/146; 162/129; 162/208; 162/210; 162/109; 428/171;
        428/286; 428/288
ARTU    173
CAS INDEXING IS AVAILABLE FOR THIS PATENT.


=> d 2 it

L3    ANSWER 2 OF 2  USPATFULL
IT     Tea
          (bags for, polyolefin fiber web-overlaid paper for)
IT     Polyolefin fibers
          (webs, paper overlaid with, for manuf. of tea bags)
IT     Bags
          (paper, polyolefin fiber web-overlaid, for tea, heat-sealable)
IT     9002-88-4
          (fiber, paper overlaid with, for manuf. of tea bags)
IT     9005-67-8
          (polyolefin fiber web-overlaid paper treated with, tea bags from)


=> file .1771textile
COST IN U.S. DOLLARS                                SINCE FILE      TOTAL
                                                         ENTRY    SESSION
FULL ESTIMATED COST                                      36.56      38.36

FILE 'TEXTILETECH' ENTERED AT 09:50:57 ON 15 OCT 2001
COPYRIGHT (C) 2001 Inst. of Textile Technology

FILE 'WTEXTILES' ENTERED AT 09:50:57 ON 15 OCT 2001
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FILE 'CAPLUS' ENTERED AT 09:50:57 ON 15 OCT 2001
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FILE COVERS 1971 TO PATENT PUBLICATION DATE: 11 Oct 2001 (20011011/PD)
FILE LAST UPDATED: 11 Oct 2001 (20011011/ED)
HIGHEST GRANTED PATENT NUMBER: US6249914
HIGHEST APPLICATION PUBLICATION NUMBER: US2001029620
CA INDEXING IS CURRENT THROUGH 11 Oct 2001 (20011011/UPCA)
ISSUE CLASS FIELDS (/INCL) CURRENT THROUGH: 11 Oct 2001 (20011011/PD)
REVISED CLASS FIELDS (/NCL) LAST RELOADED: Apr 2001
USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Apr 2001

>>> Page images are available for patents from 1/1/1998.  Patents   <<<
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>>> is included in file records.  A thesaurus is available for the  <<<
>>> USPTO Manual of Classifications in the /NCL, /INCL, and /RPCL   <<<
>>> fields.  This thesaurus includes catchword terms from the       <<<
>>> USPTO/MOC subject headings and subheadings.  Thesauri are also  <<<
>>> available for the WIPO International Patent Classification      <<<
>>> (IPC) Manuals, editions 1-6, in the /IC1, /IC2, /IC3, /IC4,     <<<
>>> /IC5, and /IC (/IC6) fields, respectively.  The thesauri in     <<<
>>> the /IC5 and /IC fields include the corresponding catchword     <<<
>>> terms from the IPC subject headings and subheadings.            <<<

This file contains CAS Registry Numbers for easy and accurate
substance identification.

=> s (tea or coffee)(l)bag?
         16455 TEA
           500 TEAS
         16641 TEA
                 (TEA OR TEAS)
         15007 COFFEE
           385 COFFEES
         15045 COFFEE
                 (COFFEE OR COFFEES)
        105056 BAG?
L1        3247 (TEA OR COFFEE)(L)BAG?

=> s non heat seal
       1115562 NON
            16 NONS
       1115566 NON
                 (NON OR NONS)
        699334 HEAT
         42382 HEATS
        704731 HEAT
                 (HEAT OR HEATS)
        325063 SEAL
        147466 SEALS
        362644 SEAL
                 (SEAL OR SEALS)
L2          14 NON HEAT SEAL
                 (NON(W)HEAT(W)SEAL)

=>

=> l1 and l2
L1 IS NOT A RECOGNIZED COMMAND
The previous command name entered was not recognized by the system.
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For a list of commands available to you in the current file, enter
"HELP COMMANDS" at an arrow prompt (=>).

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=> s l1 and l2
L3          2 L1 AND L2

=> d all

L3    ANSWER 1 OF 2  USPATFULL
AN      2000:145929  USPATFULL
TI      Porous web material
IN      Gbur, Ivan, Lancashire, United Kingdom
        Tomkinson, Brian, Bolton, United Kingdom
        Alston, Joyce, Lancashire, United Kingdom
PA      J. R. Crompton Limited, Lancashire, United Kingdom (non-U.S.
        corporation)
PI      US 6139883               20001031
        WO 9704956  19970213
AI      US 1998-983378           19980428 (8)
        WO 1996-GB1839           19960729
                                 19980428  PCT 371 date
                                 19980428  PCT 102(e) date
PRAI    GB 1995-15617       19950729
        GB 1995-23162       19951113
DT      Utility
FS      Granted
REP     US 2531594       Nov 1950  426/084.000   Abrahams
        US 2928765       Mar 1960  426/084.000   Kurjan
        US 3386834       Jun 1968  426/084.000   Noiset et al.
        US 3529925       Sep 1970  426/077.000   Thomas et al.
        US 3640727       Feb 1972  426/077.000   Heusinkveld
        US 4582666       Apr 1986  264/557.000   Kenworty et al.
        US 4801464       Jan 1989  426/079.000   Hubbard, Jr.
        US 5288402       Feb 1994  210/488.000   Yoshida
        US 5443606       Aug 1995  055/486.000   Hassenboehler, Jr. et al.
        US 5496573       Mar 1996  426/084.000   Tsuji et al.
        US 5500167       Mar 1996  264/041.000   Degen
        US 5780369       Jul 1998  442/384.000   Allison et al.
        CA 651488        Oct 1962
        EP 615921        Sep 1994
        DE 2636486       Feb 1978
        WO 9709167       Mar 1997
EXNAM   Primary Examiner: Bhat, Nina
LREP    Woodard, Emhardt, Naughton, Moriarty & McNett
CLMN    Number of Claims: 33
ECL     Exemplary Claim: 1
DRWN    1 Drawing Figure(s); 1 Drawing Page(s)
```

AB **A fibrous, porous web material of the non-heat seal** tissue having a basis weight of 9-18 gm-2 and comprises a first layer and a second layer juxtaposed thereto wherein the second layer. The first layer comprising vegetable fibers and a second layer comprising hardwood fibers, the second layer has a smaller pore size than the first layer. The paper is useful for producing beverage infusion bags (e.g. teabags) from which there is minimal passage of fine particles from the bags into their packaging.

PARN This application claims the benefit of national stage application PCT/GB96/01839, filed Jul. 29, 1996.

SUMM The present invention relates to a fibrous, porous web material of the **non-heat seal** type intended for use particularly, but not exclusively, for the production of infusion

sachets for brewing beverages such as **tea** and **coffee**
.

Infusion sachets for brewing beverages (e.g. so called teabags and **coffee bags**) are generally produced from either "heat seal" or "**non-heat seal**" fibrous porous web material (hereinafter also referred to as paper for convenience). Heat seal paper generally comprises two layers. One of these two layers includes fusible polymeric fibres which allow two layers of the paper to be heat sealed together in the production of infusion **bags**. The other layer is present as an insulation layer to prevent polymer (in the other layer) sticking to heated dies during conversion of the paper to produce an infusion sachet. In contrast, a **non-heat seal** paper (which normally has a basis weight in the range of 9 to 18 g m.sup.-2 and typically about 12.3 g m.sup.-2) is generally comprised of a single layer comprised of vegetable fibres which does not incorporate fusible polymeric fibres. Thus, as its name suggests, **non-heat seal** paper cannot be heat sealed to itself. Infusion **bags** are produced from such paper by crimping or otherwise mechanically securing two layers of the paper together.

There is however a problem in some areas with conventional **non -heat seal** papers for use in the production of teabags in that fine **tea** dust (resulting from interaction of **tea** leaves during processing thereof) or fine particles of **tea** have a tendency to pass through the paper to the outside of the teabag. Since teabags are generally packaged in boxes or other types of "outer" packaging, the fine **tea** particles or dust are "loose" in the packaging and this is undesirable from the aesthetic viewpoint.

One possibility for overcoming this problem would be to increase the percentage of finer fibres (preferably hardwood fibres) in the stock from which the single ply paper is produced. This would result in a paper with smaller pores thus reducing the amount of fine **tea** or **tea** dust which can pass through the paper.

The increase of hardwood fibres or other short fibres in the single layer to achieve the required pore size distribution would, however, affect overall paper strength to the extent that the paper would not have sufficient strength for manufacture into infusion **bags**. A further disadvantage which would be associated with the use of hardwood fibres in the layer would be the incidence of pin-hole generation through air entrainment.

A further disadvantage of conventional non-heat sealpaper is that it is difficult to provide a pattern in the paper using conventional methods. The patterns which are desired are those which can readily be produced in papers of the "heat seal" type. Such patterns may comprise a matrix of perforations which are formed through the web and which are intended to allow the passage of water therethrough. Alternatively the pattern may be either a logo or other marking indicating the manufacture of either the paper or infusion sachets prepared therefrom.

Such perforations are generally formed in heat seal paper by one of two methods. Firstly the perforations may be formed by a pattern of projections (known as knuckles) on the wire on which the fibrous suspension (used for producing the paper) is produced during the "wet laying" operation. Secondly the pattern may be formed in the web by fluid jets, e.g. using a PERFOJET apparatus.

Non-heat seal paper is generally comprised

of a single layer (as indicated above) and typically has a basis weight of 12.3 g m.sup.-2. The patterning methods discussed above cannot generally be used for such **non-heat seal** paper. Thus, if the paper is formed on a wire provided with knuckles, the paper cannot be easily released from the wire. This is believed to be due to the fact that the cellulosic fibres of the paper are more cohesive because of their greater contact with the wire and their wetness (and as such are therefore more difficult to release) than the cylindrical synthetic fibres in heat seal paper. If a liquid jet is used to pattern such a **non-heat seal** paper, the resultant material is too "open" as the jet would `strike through` the single layer and would allow beverage precursor material (e.g. **tea** leaves) to pass through the paper.

It is therefore an object of the present invention to obviate or mitigate the above mentioned disadvantages.

According to the first aspect of the present invention there is provided a fibrous, porous web material of the **non-heat seal** type having a basis weight of 9 to 18 g m.sup.-2 and comprising a first layer and a second layer juxtaposed thereto wherein the second layer has a smaller pore size then the first layer.

According to the second aspect of the present invention there is provided a beverage infusion **bag** comprising a beverage precursor material enclosed within a sachet formed of a material in accordance with the first aspect of the invention.

In the web material of the first aspect of the invention, the second layer has a smaller pore size than the first layer. The material is such that it is capable of preventing or inhibiting passage therethrough of fine particles of a beverage precursor material (e.g. **tea** leaves) and such that it has the required strength for conversion to beverage infusion **bags**. The invention thus provides a **non-heat seal** paper which may be converted to **tea bags** from which there is minimal passage of fine particles from **bags** into their packaging.

Obviously the reduction in porosity as provided by the second layer is not so high as to prevent passage of water through the material during infusion of the beverage.

The material of the invention also has the advantage that it may be patterned by means of a fluid jet, as detailed more fully below.

The material of the invention preferably has a basis weight of 9 to 15 g m.sup.-2, more preferably 9 to 14 g m.sup.-2, even more preferably 11 to 13 g m.sup.-2, and most preferably 12 to 13 g m.sup.-2. Typically the basis weight will be 12.3 to 12.4 gm.sup.-2.

The material of the invention may be produced in accordance with a third aspect of the invention by wet laying the first layer and, whilst draining water therefrom, laying the second layer on top of the first layer. This "two stage" production method has an advantage in that any voids in the first layer caused by air-entrainment will be filled (as a result of drainage through the voids) by the fibres of the second layer. Thus the size of the voids is reduced, contributing to the overall reduced porosity of the web. There is the further advantage of the "two stage" process in that for a material of a particular basis weight it allows an increased speed of production as compared to the production of a single layer material of the same basis weight.

The second layer may be produced in a number of ways to ensure that it has a pore size lower than the first layer. In a preferred embodiment of the invention, the second layer is produced from fibres (e.g. hardwood fibres) which are shorter and finer than the fibres (e.g. vegetable fibres) of the first layer. Alternatively, it is possible for the second layer to comprise fibres which are coarser than those of the first layer and to be used in an amount such as to provide a highly tortuous path along which a particle would need to pass to traverse the second layer. It is this highly tortuous path which provides the required small pore size.

As indicated, it is preferred that the majority of the fibres from which the second layer is formed have a mean cross-sectional size and/or length less than those of the first layer.

Preferably the fibres in the second layer provide 10 to 50% by weight of the total weight of the web material. In a preferred material in accordance with the invention, the first layer comprises vegetable fibres and the second layer comprises hardwood fibres.

The hardwood fibres of the second layer may for example comprise 10% to 50%, preferably 20% to 40%, by weight of the total weight of the web material. The hardwood fibres preferably have a length of 0.4 mm to 2.5 mm and may for example have a mean length of about 0.8 mm. The fibre width may be 10 to 25 .mu.m with a mean of about 14 .mu.m. Hardwood fibres are finer and shorter than softwood fibres. Examples of hardwood fibres which may be used include birch, beech and eucalypt. If desired, the second layer may comprise of Softwood, Sisal and/or Jute or man made fibres as part of the fibre components of the layer.

Although it is preferred that the second layer comprises hardwood fibres, it is possible for the second layer to be comprised of other fibre types.

Preferably the vegetable fibres of the first layer provide 50% to 90%, more preferably 50% to 70%, by weight of the web material. These fibres will generally have a length of 0.8 mm to 9 mm and may for example have a mean length of about 4.3 mm. A suitable vegetable fibre is Manila (Abaca).

If desired, the first layer may comprise Sisal and/or Jute as part of the vegetable fibre component of the layer. It may also be possible to produce a similar material with man made fibres, although the preferred way would be as described above.

If desired, a proportion of the vegetable fibres of the first layer may be replaced by softwood fibres. Preferably the amount of softwood fibres does not exceed 75% by weight of the first layer. Softwood fibres are long, flat ribbon-like fibres which are readily distinguished by a person skilled in the art from vegetable fibres and hardwood fibres. The softwood fibres may have a length of 0.8 mm to 5 mm and a width of 12 to 60 .mu.m. Typical means of these values are 3.8 mm and 29 microns respectively. The softwood fibres may for example be obtained from spruce, pine, cedar, western hemlock, fir or redwood.

It is preferred that the web material of the invention has a thickness in the range of 30-100 .mu.m more typically in the region of 40-60 .mu.m.

It should be appreciated that the invention also covers papers comprising three or more layers. Thus, it is possible in accordance with the invention to produce a paper having a central layer comprised of

softwood fibres sandwiched between an outer layer comprised of Manila fibres and another outer layer comprised of hardwood fibres. The layer comprised of hardwood fibres would have the smallest pore size whereas the layer comprised of Manila fibres may have a larger pore size than the layer comprised of softwood fibres or vice versa. This construction may be modified so that the layer comprised of Manila fibres is the central layer and the layer comprised of softwood fibres forms an outer layer.

As indicated above, the material in accordance with the invention may be patterned by means of fluid jets during the paper forming step on the papermaking fabric or wire.

If the material comprises only two layers and the fibres of the second layer are shorter and finer than those of the first layer then the pattern is formed in the second layer of the material, i.e. that layer having the smaller pores. This is an important feature since the shorter fibres (of the second layer) provide good pattern definition because of their lower cohesiveness and greater ease of movement than the longer fibres of the first layer which provide strength during processing.

The ability to provide patterns in **non-heat seal** papers is an important aspect of the present invention in its own right and therefore in accordance with a fourth aspect of the invention there is provided a method of producing a patterned paper of the **non-heat seal** type comprising wet laying a first fibrous layer and subsequently a second layer thereon, and forming a pattern in the wet laid web during the paper forming step whilst the web is on the papermaking fabric or wire by means of fluid jets.

The fluid jets are preferably liquid jets, e.g. water jets. The pattern may be formed whilst the paper is on the wire by means of a patterning station which is comprised of a rotary hollow cylinder having perforations (defining the required pattern) in the wall thereof and means for directing a fluid radially outwardly through the perforations in the cylinder to form the pattern in the web. The liquid pressure is preferably 100-800 kPa (1-8 bar), more preferably 300-400 kPa (3-4 bar). The pattern may be formed using a PERFOJET apparatus.

A method of producing a web material in accordance with the invention will be described with reference to the accompanying drawing.

The web material is formed from two fibrous stocks. One stock (for forming the first layer) comprises vegetable-fibres (and optionally other fibre types, e.g. softwood fibres) and the other stock (for forming the second layer) comprises hardwood fibres (and optionally other fibre types).

Typically the process for production of this paper is as follows:

As shown in the drawing, the stock for forming the first layer 1 is laid onto a continuously moving paper forming fabric 2 from a head box 3. Water is withdrawn as shown by the arrows 4 and the second layer 5 is subsequently laid down from a further head box 6.

A pattern is formed at a patterning station 7 comprised of a rotary perforated cylinder 8 within which is located a spray-head 9 for providing liquid (preferably water) jets, which are directed through the perforations in cylinder 8. It is these perforations which provide the desired pattern. A suction box 10 serves to remove water from the web.

The liquid jet pressure is preferably 3-4 bars which causes perforations to be formed in the layer 2. There is no substantial perforation of layer 1.

Layer 5 is the one having the smaller pore size and is formed from shorter fibres than used for layer 1.

The web may be passed around steam heat drying cylinders (not shown) or other drying means (e.g. gas heated through dryers) and may be subjected to further impregnation with additive at a size press (not shown). Wet or dry strength agents may be added either in the head box or the size press.

Other machine configurations could also be used.

Papers having the three layer construction may be produced using an apparatus of the type illustrated in the drawing modified by the inclusion of a third head box.

DETD The invention is illustrated by the following non-limiting Example.

EXAMPLE

A paper having a basis weight of 12.3 g m.sup.-2 was prepared using the procedure shown in the drawing by wet laying a first (base) layer of vegetable fibres combined with softwood and a second (top) layer of hardwood fibres which comprised 25% by weight of the total weight of the material.

Tests were conducted on the material obtained to determine how effective it was at preventing the percolation therethrough of fine sand. The sand dust percolation was determined as the percent by weight of a sample of sand having a particle size in the range 106-150 .mu.m which would pass through the paper in a standard test which involves vibrating a horizontally disposed sample of the paper on which the sand is located.

As a result of the test, less than 10% of the sand was found to have passed through the papers. This compares with a value of 35-50% obtained using a conventional **non-heat seal** paper sold in the industry.

Thus the material of the invention is superior to prior art materials for use in producing beverage infusion **bags** (e.g. **tea bags**) to prevent dust therein passing outwardly through the paper.

CLM What is claimed is:

1. A fibrous, porous web of **non-heat seal** tissue having a basis weight of 9 to 18 g m.sup.-2 and comprising a first layer comprising vegetable fibres and a second layer comprising hardwood fibres juxtaposed thereto wherein the second layer has a smaller pore size than the first layer.

2. A method as claimed in claim 1 having a basis weight of 9 to 15 g m.sup.-2.

3. A material as claimed in claim 2 having a basis weight of 9 to 14 g m.sup.-2.

4. A material as claimed in claim 3 having a basis weight of 11 to 13 g m.sup.-2.

5. A material as claimed in claim 4 having a basis weight of 12 to 13 g m.sup.-2.

6. A material as claimed in claim 1 wherein the majority of the fibres of the second layer are finer than the majority of the fibres of the first layer.

7. A material as claimed in claim 1 wherein the first layer comprises vegetable fibres in an amount to provide 50% to 90% by weight of the web material.

8. A material as claimed in claim 7 wherein the vegetable fibres of the first layer provide 50% to 70% by weight of the web material.

9. A material as claimed in claim 1 wherein the vegetable fibres have a length of 0.8 mm to 9 mm.

10. A material as claimed in claim 1 wherein the vegetable fibre is Manila.

11. A material as claimed in claim 1 wherein the first layer also incorporates softwood fibres.

12. A material as claimed in claim 11 wherein the softwood fibres have a length of 0.8 mm to 6 mm.

13. A material as claimed in claim 11 wherein the softwood fibres are of spruce, pine, cedar, western hemlock, fir or redwood.

14. A material as claimed in claim 1 wherein the hardwood fibres have a length of 0.4 mm to 2.5 mm.

15. A material as claimed in claim 1 wherein the hardwood fibres are of birch, beech or eucalypt.

16. A material as claimed in claim 1 wherein the hardwood fibres of the second layer comprise 10% to 50% by weight of the total weight of the web material.

17. A material as claimed in claim 16 wherein the hardwood fibres of the second layer comprise 20% to 40% by weight of the total weight of the web material.

18. A material as claimed in claim 1 which comprises three or more layers.

19. A material as claimed in claim 1 having a thickness of less than 100 micrcons.

20. A material as claimed in claim 1 wherein a layer of the material has a pattern formed therein by means of fluid jets.

21. A material as claimed in claim 20 comprised of two layers and wherein the pattern is formed in the layer having the smaller pore size.

22. A material as claimed in claim 21 comprised of three or more layers and wherein the pattern is formed in either of the outer layers.

23. A beverage infusion bag comprising a beverage precursor material enclosed within a sachet formed of a material as claimed in claim 1.

24. A method of producing a material as claimed in claim 1 wherein the layers are successively wet-laid onto a paper-forming fabric or wire.

25. A method as claimed in claim 24 wherein water is withdrawn from the first layer prior to laying the second layer.

26. A method as claimed in claim 24 additionally comprising the step of forming a pattern in one of the layers by means of fluid jets.

27. A method as claimed in claim 26 wherein the pattern is formed whilst the paper is on the wire by means of a patterning station which is comprised of a rotary hollow cylinder having perforations defining the required pattern in the wall thereof and means for directing a fluid radially outwardly through the perforations in the cylinder to form the pattern in the web.

28. A method as claimed in claim 26 wherein title fluid is liquid.

29. A method as claimed in claim 28 wherein the liquid pressure is 100 to 800 kPa (1 to 8 bars).

30. A method as claimed in claim 29 wherein the liquid pressure is 300 to 400 kPa (3 to 4 bars).

31. A method of producing a patterned paper of **non-heat seal** tissue comprising wet laying a first fibrous layer and subsequently a second layer thereon, and forming a pattern in the wet laid web during the paper forming step whilst the web is on the papermaking fabric or wire by means of fluid by means of fluid jets.

32. A method as claimed in claim 31 wherein water is withdrawn from the first layer prior to laying the second layer.

33. A method as claimed in claim 31 in which the first layer comprises vegetable fibres and the second layer comprises hardwood fibres.

INCL INCLM: 426/077.000
INCLS: 426/079.000; 426/084.000; 428/316.600; 162/091.000; 162/098.000; 162/141.000; 162/213.000
NCL NCLM: 426/077.000
NCLS: 162/091.000; 162/098.000; 162/141.000; 162/213.000; 426/079.000; 426/084.000; 428/316.600
IC [7]
ICM: B65B029-02
ICS: B32B007-02; D21H027-38
EXF 426/77; 426/79; 426/84; 428/316.6; 162/91; 162/98; 162/141; 162/213
ARTU 171

```
=> s l1 and l2
L3          2 L1 AND L2

=>
=> d all

L3   ANSWER 1 OF 2  USPATFULL
AN     2000:145929  USPATFULL
TI     Porous web material
IN     Gbur, Ivan, Lancashire, United Kingdom
       Tomkinson, Brian, Bolton, United Kingdom
       Alston, Joyce, Lancashire, United Kingdom
PA     J. R. Crompton Limited, Lancashire, United Kingdom (non-U.S.
       corporation)
PI     US 6139883              20001031
       WO 9704956  19970213
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       WO 1996-GB1839          19960729
                               19980428  PCT 371 date
                               19980428  PCT 102(e) date
PRAI   GB 1995-15617        19950729
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REP    US 2531594       Nov 1950  426/084.000   Abrahams
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       US 4582666       Apr 1986  264/557.000   Kenworty et al.
       US 4801464       Jan 1989  426/079.000   Hubbard, Jr.
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       US 5443606       Aug 1995  055/486.000   Hassenboehler, Jr. et al.
       US 5496573       Mar 1996  426/084.000   Tsuji et al.
       US 5500167       Mar 1996  264/041.000   Degen
       US 5780369       Jul 1998  442/384.000   Allison et al.
       CA 651488        Oct 1962
       EP 615921        Sep 1994
       DE 2636486       Feb 1978
       WO 9709167       Mar 1997
EXNAM  Primary Examiner: Bhat, Nina
LREP   Woodard, Emhardt, Naughton, Moriarty & McNett
CLMN   Number of Claims: 33
ECL    Exemplary Claim: 1
DRWN   1 Drawing Figure(s); 1 Drawing Page(s)
AB     A fibrous, porous web material of the non-heat
       seal tissue having a basis weight of 9-18 gm-2 and comprises a
       first layer and a second layer juxtaposed thereto wherein the second
       layer. The first layer comprising vegetable fibers and a second layer
       comprising hardwood fibers, the second layer has a smaller pore size
       than the first layer. The paper is useful for producing beverage
       infusion bags (e.g. teabags) from which there is minimal passage of fine
       particles from the bags into their packaging.

PARN   This application claims the benefit of national stage application
       PCT/GB96/01839, filed Jul. 29, 1996.

SUMM   The present invention relates to a fibrous, porous web material of the
       non-heat seal type intended for use
       particularly, but not exclusively, for the production of infusion
       sachets for brewing beverages such as tea and coffee
       .
```

Infusion sachets for brewing beverages (e.g. so called teabags and **coffee bags**) are generally produced from either "heat seal" or "**non-heat seal**" fibrous porous web material (hereinafter also referred to as paper for convenience). Heat seal paper generally comprises two layers. One of these two layers includes fusible polymeric fibres which allow two layers of the paper to be heat sealed together in the production of infusion **bags**. The other layer is present as an insulation layer to prevent polymer (in the other layer) sticking to heated dies during conversion of the paper to produce an infusion sachet. In contrast, a **non-heat seal** paper (which normally has a basis weight in the range of 9 to 18 g m.sup.-2 and typically about 12.3 g m.sup.-2) is generally comprised of a single layer comprised of vegetable fibres which does not incorporate fusible polymeric fibres. Thus, as its name suggests, **non-heat seal** paper cannot be heat sealed to itself. Infusion **bags** are produced from such paper by crimping or otherwise mechanically securing two layers of the paper together.

There is however a problem in some areas with conventional **non -heat seal** papers for use in the production of teabags in that fine **tea** dust (resulting from interaction of **tea** leaves during processing thereof) or fine particles of **tea** have a tendency to pass through the paper to the outside of the teabag. Since teabags are generally packaged in boxes or other types of "outer" packaging, the fine **tea** particles or dust are "loose" in the packaging and this is undesirable from the aesthetic viewpoint.

One possibility for overcoming this problem would be to increase the percentage of finer fibres (preferably hardwood fibres) in the stock from which the single ply paper is produced. This would result in a paper with smaller pores thus reducing the amount of fine **tea** or **tea** dust which can pass through the paper.

The increase of hardwood fibres or other short fibres in the single layer to achieve the required pore size distribution would, however, affect overall paper strength to the extent that the paper would not have sufficient strength for manufacture into infusion **bags**. A further disadvantage which would be associated with the use of hardwood fibres in the layer would be the incidence of pin-hole generation through air entrainment.

A further disadvantage of conventional non-heat sealpaper is that it is difficult to provide a pattern in the paper using conventional methods. The patterns which are desired are those which can readily be produced in papers of the "heat seal" type. Such patterns may comprise a matrix of perforations which are formed through the web and which are intended to allow the passage of water therethrough. Alternatively the pattern may be either a logo or other marking indicating the manufacture of either the paper or infusion sachets prepared therefrom.

Such perforations are generally formed in heat seal paper by one of two methods. Firstly the perforations may be formed by a pattern of projections (known as knuckles) on the wire on which the fibrous suspension (used for producing the paper) is produced during the "wet laying" operation. Secondly the pattern may be formed in the web by fluid jets, e.g. using a PERFOJET apparatus.

Non-heat seal paper is generally comprised of a single layer (as indicated above) and typically has a basis weight of 12.3 g m.sup.-2. The patterning methods discussed above cannot generally be used for such **non-heat seal**

paper. Thus, if the paper is formed on a wire provided with knuckles, the paper cannot be easily released from the wire. This is believed to be due to the fact that the cellulosic fibres of the paper are more cohesive because of their greater contact with the wire and their wetness (and as such are therefore more difficult to release) than the cylindrical synthetic fibres in heat seal paper. If a liquid jet is used to pattern such a **non-heat seal** paper, the resultant material is too "open" as the jet would `strike through` the single layer and would allow beverage precursor material (e.g. **tea** leaves) to pass through the paper.

It is therefore an object of the present invention to obviate or mitigate the above mentioned disadvantages.

According to the first aspect of the present invention there is provided a fibrous, porous web material of the **non-heat seal** type having a basis weight of 9 to 18 g m.sup.-2 and comprising a first layer and a second layer juxtaposed thereto wherein the second layer has a smaller pore size then the first layer.

According to the second aspect of the present invention there is provided a beverage infusion **bag** comprising a beverage precursor material enclosed within a sachet formed of a material in accordance with the first aspect of the invention.

In the web material of the first aspect of the invention, the second layer has a smaller pore size than the first layer. The material is such that it is capable of preventing or inhibiting passage therethrough of fine particles of a beverage precursor material (e.g. **tea** leaves) and such that it has the required strength for conversion to beverage infusion **bags**. The invention thus provides a **non-heat seal** paper which may be converted to **tea bags** from which there is minimal passage of fine particles from **bags** into their packaging.

Obviously the reduction in porosity as provided by the second layer is not so high as to prevent passage of water through the material during infusion of the beverage.

The material of the invention also has the advantage that it may be patterned by means of a fluid jet, as detailed more fully below.

The material of the invention preferably has a basis weight of 9 to 15 g m.sup.-2, more preferably 9 to 14 g m.sup.-2, even more preferably 11 to 13 g m.sup.-2, and most preferably 12 to 13 g m.sup.-2. Typically the basis weight will be 12.3 to 12.4 gm.sup.-2.

The material of the invention may be produced in accordance with a third aspect of the invention by wet laying the first layer and, whilst draining water therefrom, laying the second layer on top of the first layer. This "two stage" production method has an advantage in that any voids in the first layer caused by air-entrainment will be filled (as a result of drainage through the voids) by the fibres of the second layer. Thus the size of the voids is reduced, contributing to the overall reduced porosity of the web. There is the further advantage of the "two stage" process in that for a material of a particular basis weight it allows an increased speed of production as compared to the production of a single layer material of the same basis weight.

The second layer may be produced in a number of ways to ensure that it has a pore size lower than the first layer. In a preferred embodiment of the invention, the second layer is produced from fibres (e.g. hardwood fibres) which are shorter and finer than the fibres (e.g. vegetable

fibres) of the first layer. Alternatively, it is possible for the second layer to comprise fibres which are coarser than those of the first layer and to be used in an amount such as to provide a highly tortuous path along which a particle would need to pass to traverse the second layer. It is this highly tortuous path which provides the required small pore size.

As indicated, it is preferred that the majority of the fibres from which the second layer is formed have a mean cross-sectional size and/or length less than those of the first layer.

Preferably the fibres in the second layer provide 10 to 50% by weight of the total weight of the web material. In a preferred material in accordance with the invention, the first layer comprises vegetable fibres and the second layer comprises hardwood fibres.

The hardwood fibres of the second layer may for example comprise 10% to 50%, preferably 20% to 40%, by weight of the total weight of the web material. The hardwood fibres preferably have a length of 0.4 mm to 2.5 mm and may for example have a mean length of about 0.8 mm. The fibre width may be 10 to 25 .mu.m with a mean of about 14 .mu.m. Hardwood fibres are finer and shorter than softwood fibres. Examples of hardwood fibres which may be used include birch, beech and eucalypt. If desired, the second layer may comprise of Softwood, Sisal and/or Jute or man made fibres as part of the fibre components of the layer.

Although it is preferred that the second layer comprises hardwood fibres, it is possible for the second layer to be comprised of other fibre types.

Preferably the vegetable fibres of the first layer provide 50% to 90%, more preferably 50% to 70%, by weight of the web material. These fibres will generally have a length of 0.8 mm to 9 mm and may for example have a mean length of about 4.3 mm. A suitable vegetable fibre is Manila (Abaca).

If desired, the first layer may comprise Sisal and/or Jute as part of the vegetable fibre component of the layer. It may also be possible to produce a similar material with man made fibres, although the preferred way would be as described above.

If desired, a proportion of the vegetable fibres of the first layer may be replaced by softwood fibres. Preferably the amount of softwood fibres does not exceed 75% by weight of the first layer. Softwood fibres are long, flat ribbon-like fibres which are readily distinguished by a person skilled in the art from vegetable fibres and hardwood fibres. The softwood fibres may have a length of 0.8 mm to 5 mm and a width of 12 to 60 .mu.m. Typical means of these values are 3.8 mm and 29 microns respectively. The softwood fibres may for example be obtained from spruce, pine, cedar, western hemlock, fir or redwood.

It is preferred that the web material of the invention has a thickness in the range of 30-100 .mu.m more typically in the region of 40-60 .mu.m.

It should be appreciated that the invention also covers papers comprising three or more layers. Thus, it is possible in accordance with the invention to produce a paper having a central layer comprised of softwood fibres sandwiched between an outer layer comprised of Manila fibres and another outer layer comprised of hardwood fibres. The layer comprised of hardwood fibres would have the smallest pore size whereas the layer comprised of Manila fibres may have a larger pore size than the layer comprised of softwood fibres or vice versa. This construction

may be modified so that the layer comprised of Manila fibres is the central layer and the layer comprised of softwood fibres forms an outer layer.

As indicated above, the material in accordance with the invention may be patterned by means of fluid jets during the paper forming step on the papermaking fabric or wire.

If the material comprises only two layers and the fibres of the second layer are shorter and finer than those of the first layer then the pattern is formed in the second layer of the material, i.e. that layer having the smaller pores. This is an important feature since the shorter fibres (of the second layer) provide good pattern definition because of their lower cohesiveness and greater ease of movement than the longer fibres of the first layer which provide strength during processing.

The ability to provide patterns in **non-heat seal** papers is an important aspect of the present invention in its own right and therefore in accordance with a fourth aspect of the invention there is provided a method of producing a patterned paper of the **non-heat seal** type comprising wet laying a first fibrous layer and subsequently a second layer thereon, and forming a pattern in the wet laid web during the paper forming step whilst the web is on the papermaking fabric or wire by means of fluid jets.

The fluid jets are preferably liquid jets, e.g. water jets. The pattern may be formed whilst the paper is on the wire by means of a patterning station which is comprised of a rotary hollow cylinder having perforations (defining the required pattern) in the wall thereof and means for directing a fluid radially outwardly through the perforations in the cylinder to form the pattern in the web. The liquid pressure is preferably 100-800 kPa (1-8 bar), more preferably 300-400 kPa (3-4 bar). The pattern may be formed using a PERFOJET apparatus.

A method of producing a web material in accordance with the invention will be described with reference to the accompanying drawing.

The web material is formed from two fibrous stocks. One stock (for forming the first layer) comprises vegetable-fibres (and optionally other fibre types, e.g. softwood fibres) and the other stock (for forming the second layer) comprises hardwood fibres (and optionally other fibre types).

Typically the process for production of this paper is as follows:

As shown in the drawing, the stock for forming the first layer 1 is laid onto a continuously moving paper forming fabric 2 from a head box 3. Water is withdrawn as shown by the arrows 4 and the second layer 5 is subsequently laid down from a further head box 6.

A pattern is formed at a patterning station 7 comprised of a rotary perforated cylinder 8 within which is located a spray-head 9 for providing liquid (preferably water) jets, which are directed through the perforations in cylinder 8. It is these perforations which provide the desired pattern. A suction box 10 serves to remove water from the web.

The liquid jet pressure is preferably 3-4 bars which causes perforations to be formed in the layer 2. There is no substantial perforation of layer 1.

Layer 5 is the one having the smaller pore size and is formed from shorter fibres than used for layer 1.

The web may be passed around steam heat drying cylinders (not shown) or other drying means (e.g. gas heated through dryers) and may be subjected to further impregnation with additive at a size press (not shown). Wet or dry strength agents may be added either in the head box or the size press.

Other machine configurations could also be used.

Papers having the three layer construction may be produced using an apparatus of the type illustrated in the drawing modified by the inclusion of a third head box.

DETD The invention is illustrated by the following non-limiting Example.

EXAMPLE

A paper having a basis weight of 12.3 g m.sup.-2 was prepared using the procedure shown in the drawing by wet laying a first (base) layer of vegetable fibres combined with softwood and a second (top) layer of hardwood fibres which comprised 25% by weight of the total weight of the material.

Tests were conducted on the material obtained to determine how effective it was at preventing the percolation therethrough of fine sand. The sand dust percolation was determined as the percent by weight of a sample of sand having a particle size in the range 106-150 .mu.m which would pass through the paper in a standard test which involves vibrating a horizontally disposed sample of the paper on which the sand is located.

As a result of the test, less than 10% of the sand was found to have passed through the papers. This compares with a value of 35-50% obtained using a conventional **non-heat seal** paper sold in the industry.

Thus the material of the invention is superior to prior art materials for use in producing beverage infusion **bags** (e.g. **tea bags**) to prevent dust therein passing outwardly through the paper.

CLM What is claimed is:

1. A fibrous, porous web of **non-heat seal** tissue having a basis weight of 9 to 18 g m.sup.-2 and comprising a first layer comprising vegetable fibres and a second layer comprising hardwood fibres juxtaposed thereto wherein the second layer has a smaller pore size than the first layer.

2. A method as claimed in claim 1 having a basis weight of 9 to 15 g m.sup.-2.

3. A material as claimed in claim 2 having a basis weight of 9 to 14 g m.sup.-2.

4. A material as claimed in claim 3 having a basis weight of 11 to 13 g m.sup.-2.

5. A material as claimed in claim 4 having a basis weight of 12 to 13 g m.sup.-2.

6. A material as claimed in claim 1 wherein the majority of the fibres of the second layer are finer than the majority of the fibres of the first layer.

7. A material as claimed in claim 1 wherein the first layer comprises vegetable fibres in an amount to provide 50% to 90% by weight of the web material.

8. A material as claimed in claim 7 wherein the vegetable fibres of the first layer provide 50% to 70% by weight of the web material.

9. A material as claimed in claim 1 wherein the vegetable fibres have a length of 0.8 mm to 9 mm.

10. A material as claimed in claim 1 wherein the vegetable fibre is Manila.

11. A material as claimed in claim 1 wherein the first layer also incorporates softwood fibres.

12. A material as claimed in claim 11 wherein the softwood fibres have a length of 0.8 mm to 6 mm.

13. A material as claimed in claim 11 wherein the softwood fibres are of spruce, pine, cedar, western hemlock, fir or redwood.

14. A material as claimed in claim 1 wherein the hardwood fibres have a length of 0.4 mm to 2.5 mm.

15. A material as claimed in claim 1 wherein the hardwood fibres are of birch, beech or eucalypt.

16. A material as claimed in claim 1 wherein the hardwood fibres of the second layer comprise 10% to 50% by weight of the total weight of the web material.

17. A material as claimed in claim 16 wherein the hardwood fibres of the second layer comprise 20% to 40% by weight of the total weight of the web material.

18. A material as claimed in claim 1 which comprises three or more layers.

19. A material as claimed in claim 1 having a thickness of less than 100 micrcons.

20. A material as claimed in claim 1 wherein a layer of the material has a pattern formed therein by means of fluid jets.

21. A material as claimed in claim 20 comprised of two layers and wherein the pattern is formed in the layer having the smaller pore size.

22. A material as claimed in claim 21 comprised of three or more layers and wherein the pattern is formed in either of the outer layers.

23. A beverage infusion bag comprising a beverage precursor material enclosed within a sachet formed of a material as claimed in claim 1.

24. A method of producing a material as claimed in claim 1 wherein the layers are successively wet-laid onto a paper-forming fabric or wire.

25. A method as claimed in claim 24 wherein water is withdrawn from the first layer prior to laying the second layer.

26. A method as claimed in claim 24 additionally comprising the step of forming a pattern in one of the layers by means of fluid jets.

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